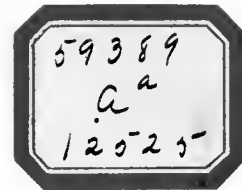


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THE IRRIGATION AGE

PUBLISHED IN THE INTEREST OF IRRIGATION
AND DRAINAGE

SPECIAL FEATURES

Twenty-One Years Old.

After More Money.

Wonderful Washington.

Ingleton Steam Plow.

More About Montana.

A Neglected Opportunity.

The Escalante Desert.

Application of Power
to Farm Work.

NOVEMBER
1905.

THE D. H. ANDERSON
PUBLISHING CO.,
Publishers.
112 DEARBORN ST.,
CHICAGO.

TEN CENTS A COPY
ONE DOLLAR A YEAR

THE
IRRIGATION AGE
ESTABLISHED 1885
WITH WHICH IS MERGED
THE DRAINAGE JOURNAL
ESTABLISHED 1879

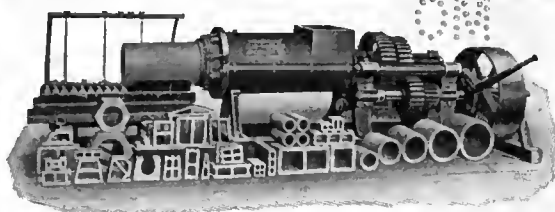
CHARLES A.
COX
CHGO.

Morris Machine Works BALDWINVILLE, N. Y.

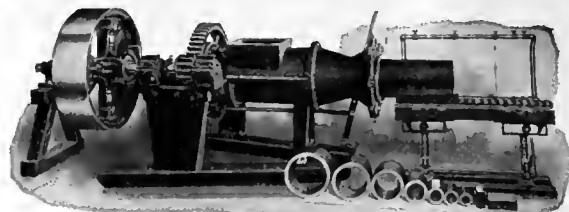
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designed for any irrigating propo-
sition. Send details or specifica-
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will recommend a pumping outfit
to supply the need.

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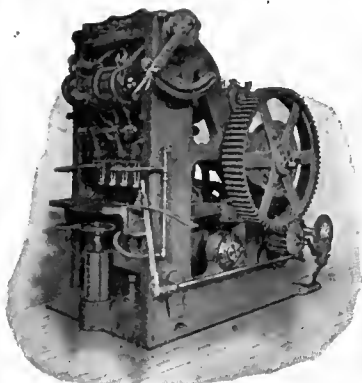




Centennial Auger Machine



Mascot Auger Machine



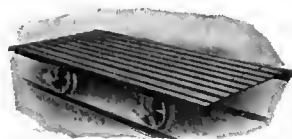
Dry Press, 5 styles



Wheelbarrows and Trucks



Eagle Repress



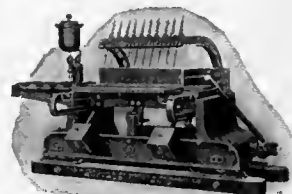
Dry Cars, all kinds

Clay Working Machinery

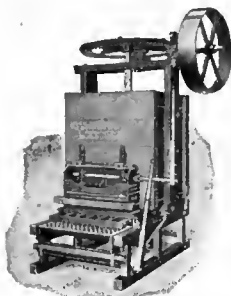
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RUN RIGHT"

We build an entire line of Clay Working Machinery for the manufacture of Clay products by all processes, including Sand-Line Brick. Our yard supplies are the best. Kiln Irons, Cutting Wire and all supplies. Send for information or catalogue.

The American Clay
Mch. Co...Bucyrus, Ohio



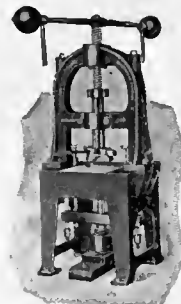
Hand and Power Cutters



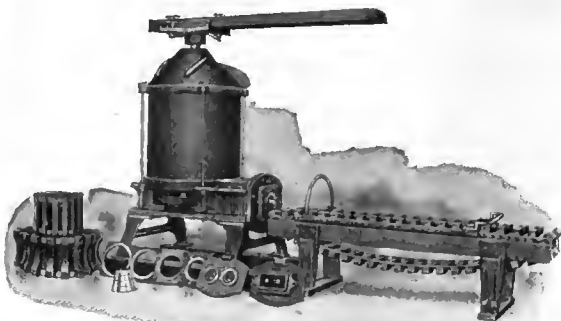
Soft Mud Machines, Horse
and Steam Power



Disintegrators



Hand Power Screw Press



Horse Power Plunger Machine

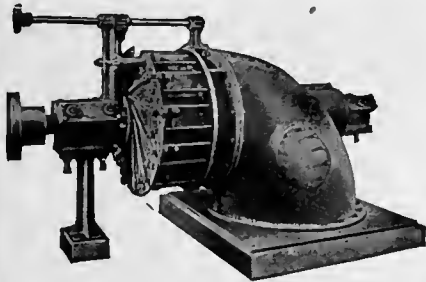


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STANDARD FOR SIXTY-FIVE YEARS


 JOHN DEERE

MADE BY DEERE & CO., MOLINE, ILL.



SAMSON TURBINE

We build these turbines in all SIZES and STYLES, on UPRIGHT or HORIZONTAL shafts, BELTED or DIRECT CONNECTED, SINGLE or in PAIRS. They are suitable for direct connecting to GENERATORS, AIR-COMPRESSORS, PUMPS or other machinery driven on horizontal shafting.

JAMES LEFFEL & CO., Springfield, Ohio, U. S. A.

Write Department K-2 for Catalog.

OTTO ENGINES

Less Repairs and Less Fuel

It is what an engine costs to *keep it running* that cuts the big figure and not the *first cost*. The St. Anthony & Dakota Elevator Co., Minneapolis, Minn., writes: "In April, '02, we had 92 'Otto' engines running, all of which gave better satisfaction, cost less for repairs and consumed much less fuel than any others we had tried. During the season of 1902 we bought 35 more 'Otto's' and now have 127 of them." A splendid testimonial to the merits of the "Otto" from people who have tried *many* others.

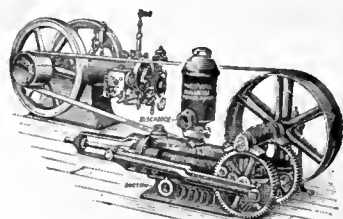


OTTO GAS ENGINE WORKS, Phila., Pa.

STANDARD OF THE WORLD

MYERS POWER PUMPS

WITHOUT AN EQUAL ON THE GLOBE



OPERATING
WITH
GAS ENGINE

FIG. 952

HORIZONTAL BULLDOZERS, 3" to 6" CYLINDERS

MYERS
BACK GEARED
WORKING HEAD

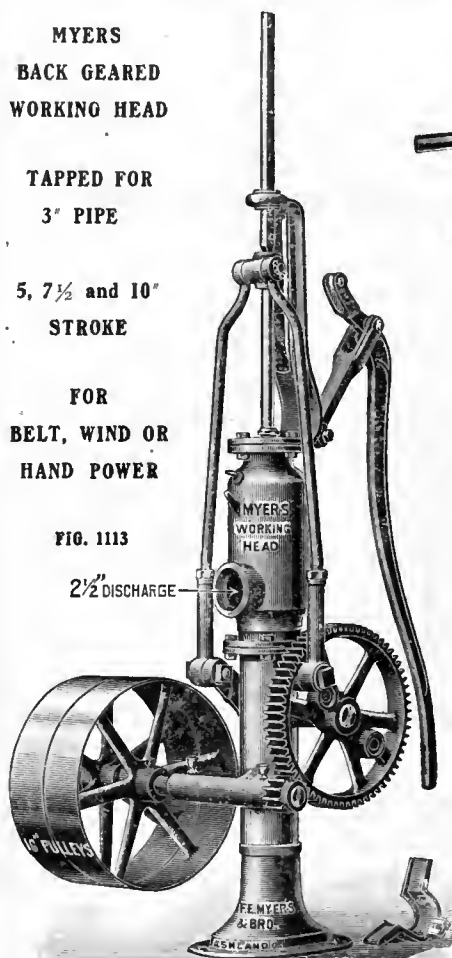
TAPPED FOR
3" PIPE

5, 7½ and 10"
STROKE

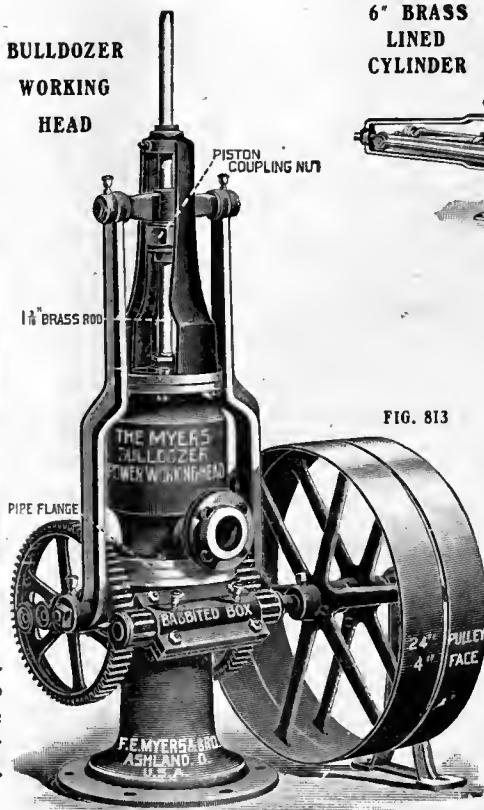
FOR
BELT, WIND OR
HAND POWER

FIG. 1113

2½" DISCHARGE

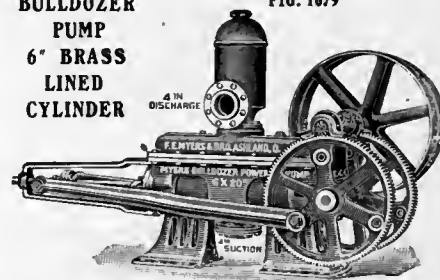


BULLDOZER
WORKING
HEAD



BULLDOZER
PUMP
6" BRASS
LINED
CYLINDER

FIG. 1079



MYERS BULLDOZER
WORKING HEADS

No. 359

5", 7½", 10" STROKE
DISCHARGE, 2½ or 3 INCHES
SUCTION 2 to 4 INCHES

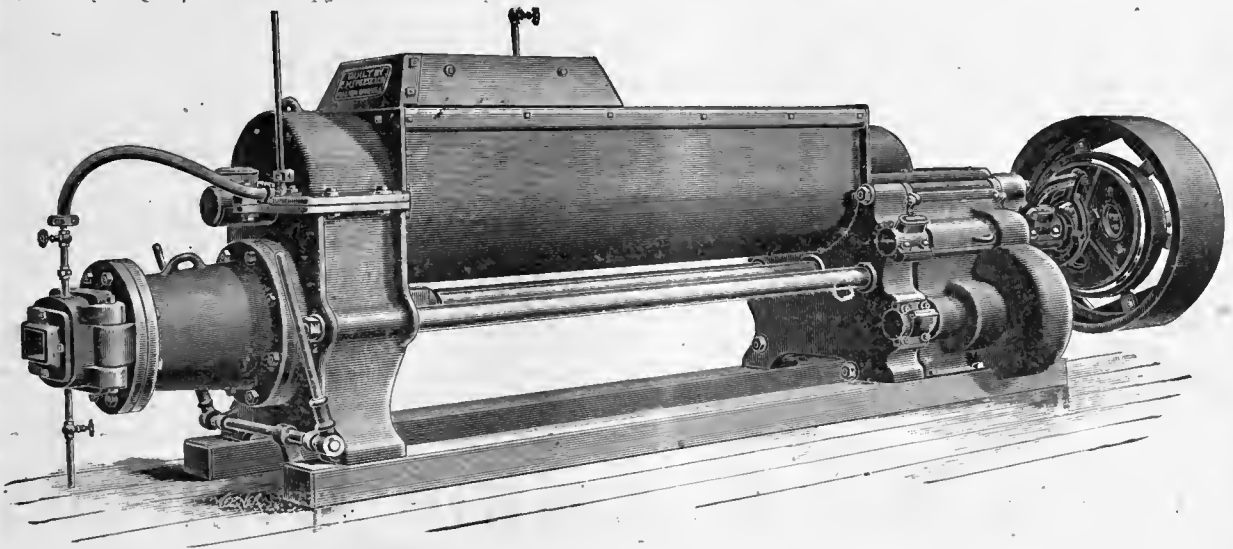
No. 364

12", 16", 20" STROKE
REGULARLY FITTED 4" DIS-
CHARGE
SUCTION 8" OR LESS

Write for Descriptive Circulars and Prices.
We want you to acknowledge this Ad. so
that we can acquaint you in detail with the
superior features of Myers Power
Pumps. This is the proper season.
The right time to write is right now.

F. E. MYERS & BRO., ASHLAND OHIO, U.S.A.
PROPRIETORS OF
ASHLAND PUMP AND HAY TOOL WORKS

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FIVE SIZES ALL CAPACITIES

Outfits for Drain Tile, Hollow Ware, Building
and Paving Brick and other Clay Products

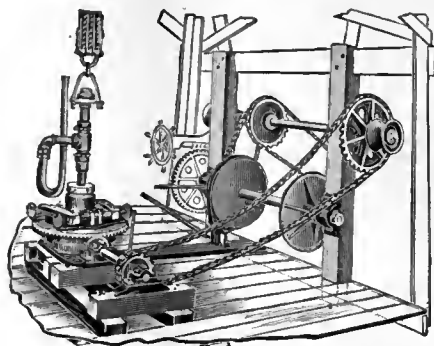
If interested write us for particulars and estimates.

E. M. FREESE & CO.
GALION, OHIO

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Well and
Prospecting
Machinery

Suited to Your Wants

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"LIGHTNING WELL MACHINERY." Can Show Core Through all Hard Materials
THE AMERICAN WELL WORKS,



Aurora, Ill.,

Also Steam and Power
Pumping
Machinery
Compressors
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We want every Dealer who handles
Well or Pumping Machinery or Appli-
ances to correspond with us.
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NO ATTENTION
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RIFE AUTOMATIC HYDRAULIC RAM
PUMPS WATER BY WATER POWER

Large Capacity Rams for Irrigation

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80 per cent efficiency developed. ∴ Over 4,500 plants in successful operation. ∴ In-
formation and estimates promptly and cheerfully furnished. ∴ Catalog Free.

RIFE ENGINE COMPANY

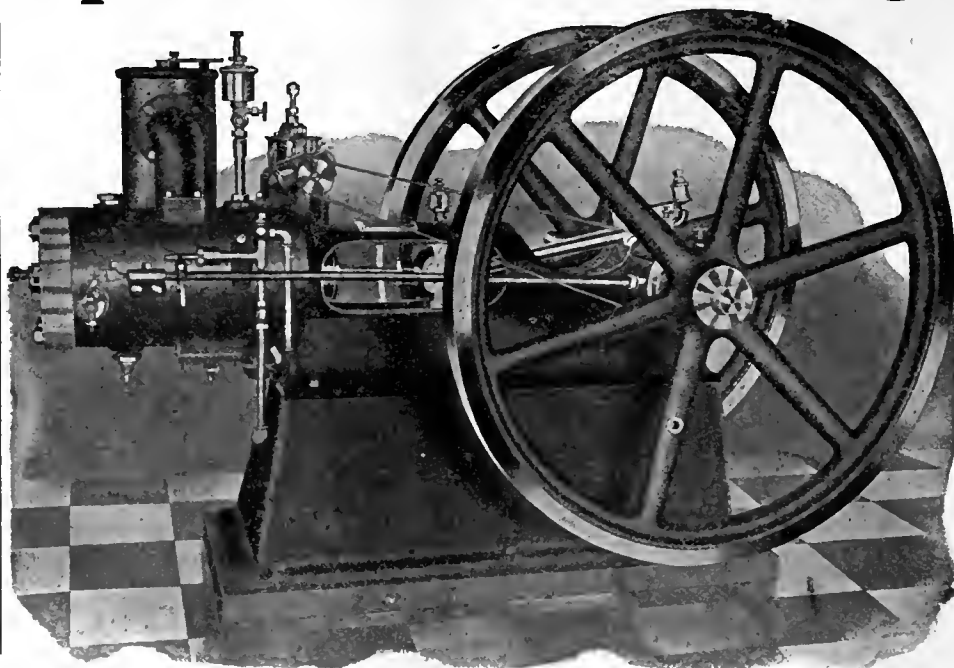
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NEW YORK, U. S. A.

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of
Having
Water
When You
Need It

Pump it
with a
Centrifugal
Pump
and
Dempster
Engine



Dempster
Gasoline
Engines
2 to 30
Horse
Power

Reliable
Economical
Durable
Always
Ready
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THE IRRIGATION AGE

VOL. XXI

CHICAGO, NOVEMBER, 1905.

No. 1

THE IRRIGATION AGE

With which is Merged

MODERN IRRIGATION
THE IRRIGATION ERA
ARID AMERICA

THE DRAINAGE JOURNAL
MID-WEST
THE FARM HERALD

THE D. H. ANDERSON PUBLISHING CO.,
PUBLISHERS,

112 Dearborn Street, - - CHICAGO

Entered at the Postoffice at Chicago, Ill., as Second-Class Matter.

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W. J. ANDERSON }

Western Office: Chamber of Commerce Building, Denver, Colo.
GEO. W. WAGNER, Mgr. M. C. JACKSON, Editor, Western Dept.

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A monthly illustrated magazine recognized throughout the world as the exponent of Irrigation and its kindred industries. It is the pioneer journal of its kind in the world, and has no rival in half a continent. It advocates the mineral development and the industrial growth of the West.

Interesting to Advertisers.

It may interest advertisers to know that *The Irrigation Age* is the only publication in the world having an actual paid in advance circulation among individual irrigators and large irrigation corporations. It is read regularly by all interested in this subject and has readers in all parts of the world. *The Irrigation Age* is 20 years old and is the pioneer publication of its class in the world.

Here is a good one from the standpoint of George, taken from Maxwell's *Talisman*, September, 1905:

Humorous. "Some faint echoes which have reached the national capital of the recent National Irrigation Congress held at Portland, Ore., would seem to indicate that the usefulness of that body has to a considerable extent departed."

It will be noted that the gentleman who poses as the head of the National Irrigation Association believes that the usefulness of the National Irrigation Congress ended when it passed unanimously a resolution repudiating that association.

The lines quoted from the *Talisman* are humorous in the extreme, when one considers the source and the condition that caused them to be penned. Poor George! How have the mighty fallen?

Primer of Irrigation. After innumerable delays caused by a desire to bring the work as nearly up to date as possible, the *Primer of Irrigation* is off the press and is now being shipped in large numbers to those whose orders have been on our books for the past year or more. We wish to apologize particularly to those who have placed their order with us for a copy of the *Primer of Irrigation*, for the long delay in its appearance.

Judging from the number of orders received for this work it will have a large sale. We are now negotiating with one house to handle 5,000 copies of the work, which will give it wide distribution and extensive advertising. The price of the *Primer of Irrigation*, cloth bound, is \$2.00. The price where ordered in connec-

tion with a subscription to *THE IRRIGATION AGE* is \$1.50; in other words, we quote a combination price of \$2.50 for *THE IRRIGATION AGE* one year and the *Primer of Irrigation*, postpaid. Those who have not ordered a copy should write us at once and secure one of the first edition, which will soon be exhausted.

Twenty-one Years Old. This, the November issue of *THE IRRIGATION AGE*, starts in Number One, Volume Twenty-one, of this publication, which means that it has been published for over twenty years. It may not be out of place to state here that *THE IRRIGATION AGE* is the pioneer publication of its class in the world and is older by over eighteen years than any other publication issued today in the interest of irrigation or kindred lines. During the past five years the publishers of this journal have purchased the following named papers, all of which have been merged with *THE IRRIGATION AGE*, thereby very much increasing and extending its circulation:

Modern Irrigation, Denver; *The Irrigation Era*, Denver; *Arid America*, Denver; *The Drainage Journal*, Indianapolis; *Mid-West*, Denver; *The Farm Herald*, Denver.

It will be noted from the foregoing list that *THE IRRIGATION AGE* has purchased at different times all of the irrigation journals published in Denver or west of Chicago prior to 1902, hence any other publication claiming to have been in existence for a longer period than two years misrepresent facts and ought to be looked upon with suspicion by the advertising public. *THE IRRIGATION AGE* has always been considered authority

in its line and will continue to lead as a newsgatherer and the exponent of all that is fair in irrigation development. It will, moreover, be ready at all times to expose frauds, and will freely criticize moves made on the part of government officials which are not in keeping with good business rules and integrity. It is the intention of the editor to fully exploit during the coming year many mistakes which have been made and are now forming which would throw discredit on the Geological Survey and the Reclamation Service. Information which will assist us in improving this paper in a news or editorial way, also information concerning the interference of private rights by the Reclamation Service, will be thankfully received.

After More Money. The following notice, sent in by the St. Louis correspondent of a well-known implement paper, illustrates how a body of intelligent men may regularly be misled and induced to contribute funds to an organization such as the National Irrigation Association, which has been repudiated by the National Irrigation Congress:

The regular monthly meeting of the Implement and Vehicle Board of Trade for October was held this evening in the parlors of the Jefferson Hotel. An excellent luncheon was served at 6:30, and the meeting was called to order by President Robbins at 7:45, thirty-six members being present.

Owing to the presence of the guest of the evening, C. B. Boothe, the regular order of business was suspended in order to listen to the remarks of Mr. Boothe on irrigation and the reclaiming of our arid lands. Mr. Boothe, who is chairman of the board of directors of the National Irrigation Association, made an interesting address on the progress of irrigation as represented by the work of the National Irrigation Association. In order to more clearly emphasize his remarks a large map of the West was used, showing progress in different parts of the country.

If the members of the St. Louis Implement and Vehicle Club could be made aware of the facts and were to make an effort to learn where the money contributed by that organization is expended and by whom, they would very suddenly decide to withdraw from connection with it. For the benefit of the members of the St. Louis Implement and Vehicle Club we reprint a resolution passed unanimously by the Thirteenth National Irrigation Congress:

"This Congress calls attention to the fact that there is not nor has there been any connection whatever between the National Irrigation Congress and the incorporated company known as the National Irrigation Association, and it is hereby announced that no person, corporation or company has been, or is authorized to solicit or collect money for or in behalf of the National Irrigation Congress."

Dry Farm Experiment. THE IRRIGATION AGE has made arrangements with the officials of the Union Pacific Railway whereby it is to secure title to 160 acres of land on the line of that road near Denver, said 160 acres to be developed as an

experimental farm by the publisher with the view to demonstrating what can be done in the way of raising crops successfully by the Campbell method. In this line of work it is expected that much assistance will be given us by Professor Campbell, who has done so much to develop his ideas and improve the possibilities of agriculture in Nebraska, Kansas and Colorado. It is the intention of the publisher to erect farm buildings on this land, place it in charge of a competent farmer and publish regularly reports of the progress of the work under the Campbell system. In view of the fact that such phenomenal development occurred under the Campbell system by farming, it is our impression that this subject is equally as important in the territory named as irrigation, and our aim will be to demonstrate by this series of illustrated articles, covering the experiments on the farm, just what may be done by people of the West who contemplate moving into that territory. We will also try and tell them what amount of money is necessary to secure a start on a tract of this land and will give them an idea of the cost per acre in different localities and permit them to invest in a Western farm home in a more intelligent manner than would otherwise be possible. We intend to publish all of the moves made on this farm, beginning with the time that the sod is broken, and will explain also where failures occur; so that those who contemplate investing may avoid similar mistakes and thereby more easily succeed.

Our readers are requested to correspond with this office regularly concerning this experimental work and all inquiries will be gladly and fully answered in the columns of THE IRRIGATION AGE. It is our impression that an expenditure of from \$800 to \$1,000 will be sufficient to start work on a tract of 160 acres. This will include a modest sum for the home for our farmer and barn for his stock, a team of horses, cow and other domestic animals. This sum will not, of course, allow extravagant expenditure, but our aim will be to illustrate to our readers what may be done on a small sum of money, so that they may be assured before leaving for the West what the funds they have on hand will accomplish. These series of articles will, moreover, prove of benefit to all of the Western railways along whose lines lands of a similar character are located.

More detailed information concerning this work will be published in a future issue.

A Lie Nailed.

In view of the fact that THE IRRIGATION AGE has seen fit to criticize the methods of the Reclamation Service and expose conditions which it is satisfied are wrong in connection with the National Irrigation Association, which was turned down by the National Irrigation Congress at Portland, a journal which was started a year or possibly a year and a half ago, purporting to represent the irrigation interests, has something to say concerning

the National Irrigation Congress and some of the resolutions passed by that body. In view of the fact that the editor of that publication was only evident at the Congress in the capacity of a distributor of his journals at the entrance of the meeting place of the Congress, and in view also of the fact that the irrigation journal mentioned had considerable difficulty in being admitted as second-class matter in the United States mail, this editor takes, in our estimation, a rather haughty stand. The fact of the matter is that when the above mentioned sheet was started it attempted to appropriate the volume number of a journal which had been purchased and merged with *THE IRRIGATION AGE*, a flagrant violation of all newspaper courtesy and in direct violation of the laws governing the admittance of newspapers to the mail. In other words, this journal started in its first number under the old volume number of "Modern Irrigation," a journal purchased by *THE IRRIGATION AGE* and taken over by it. The high-handed plan of placarding their journal as being seventeen years old was immediately "called" by the Post Office Department at Washington, and it was many months before they were admitted in regular form as second-class matter. In view of the fact then that the publishers of this journal deliberately attempted to deceive their readers by giving them the impression that their paper was seventeen years old instead of one month, we insist, that its editors are very venturesome, to say the least, when they take a high moral ground and criticise the publisher of a journal which has been conducted on clean grounds for over twenty years. The fact of the matter is that the editor of *THE IRRIGATION AGE* was publishing a clean irrigation journal long before the gentlemen of that institution were ever heard of, and it is safe to make the statement that these men are taking a position directly against that occupied by *THE IRRIGATION AGE* for the sole purpose of winning the favor of gentlemen connected with the Reclamation Service and other bureaus in Washington who have been criticised by *THE IRRIGATION AGE*. From a rather broad view, one would think that such a move would be good for a journal; perhaps it is, but it is the impression of *THE IRRIGATION AGE* that neither the publishers alluded to or the members of the Reclamation Service or the repudiated National Irrigation Association will, in any way, be benefited. Right will win in the end, and the head of the Reclamation Service, as well as all others, realize that the time is not far distant when the public will awaken to the fact that *THE IRRIGATION AGE* is right in the matter and a radical change will, no doubt, take place in the personnel of the Reclamation Service. The fact of the matter is that the resolution referred to by these men was prepared and introduced by Mr. Shumway, of Nebraska, one of the brightest delegates of the Congress, and Mr. Newell and his band of followers with halos, will hear more of the resolution at some future time.

We reproduce herewith the notice mentioned:

"A disturber from Chicago, named Anderson, who for years has been unwarrantedly abusing the departments referred to in the resolution, apparently for no other reason than that these departments are not conducted like Chicago political bureaus which yield more revenue to the grafters in control than to the people for whose benefit they are created, instigated the introduction of a resolution which called for a politically-constructed commission to handle the vast fund in the present excellently-constituted reclamation bureau, met with a worse fate at the hands of the Committee on Resolutions, for it was given no consideration. It was unfortunate that the Chicago politician succeeded in poisoning the minds of many of the readers of his publication in the belief that the National Irrigation Association was securing money for its support on the plea that such funds were for the benefit of the National Irrigation Congress. It only required the appearance of C. B. Boothe, of Los Angeles, Cal., of the association and chairman of the Executive Committee of the Congress, to face these misled members (the accuser not having the courage to be present) and to give the lie to the base accusations; so the original blackguarding resolution was defeated. The Chicagoan's champion in this matter was one McAlpine, from Minnesota, whose connection with a number of government timber transactions would make sensational reading. It was a surprise to many (not well acquainted with the facts) that Senator Carter, of Montana, should also be an advocate of a resolution of censure directed at the association."

It will be noted that the writer of the above expresses some surprise at the stand taken by United States Senator Carter. If said writer had any insight into irrigation conditions he would not expose his ignorance at wondering why any one of ordinary intelligence should take a stand similar to that of Senator Carter, who is one of the few men who has made a study of conditions surrounding irrigation development and who can tell the difference between a ripe apple and a bad egg. It will be our pleasure, in some future issue of *THE IRRIGATION AGE*, to illustrate to our readers something of the experiences and history of the gentlemen who are conducting the journal that has seen fit to criticize the editor of *THE IRRIGATION AGE*. We will be glad to give facts concerning their history and state clearly and honestly their virtues, if any may be discovered, as well as their failings. Regarding the statement in the foregoing quotation, that the man who presented the resolution failed to attend the meeting of the committee, Mr. Shumway, its author, as well as the editor of *IRRIGATION AGE*, attended every meeting of the committee and were looking to Mr. Boothe, of the "Incorporated Company," the National Irrigation Association, to make a statement of its financial affairs. Mr. Boothe failed to make good in any particular, and is looked upon as a "dead one" by all members of the Committee on Resolutions.

**Send \$2.50 for The Irrigation Age
1 year, and The Primer of Irrigation**

Nature has lavished her richest gifts upon wonderful Washington. There is no land **Wonderful** and water area of its size in the world **Washington.** more perfectly adapted to the highest development of the human race. Geographical location, climate, topography, navigable waters abounding in fish, mountains stored with base and precious metals, rich deposits of coal, limitless supplies of water for power, irrigation and drinking purposes, forests of giant timber, productive soil suitable to the luxuriant growth of almost everything that man requires; these are some of the conditions, advantages and resources that make Washington an empire in itself, and destine it to become populous and among the foremost sections of the world in commerce, trade and industry. The diversity of Washington's resources causes men to marvel at the prodigality of nature. Vermont has her marble, Pennsylvania her coal, Niagara her cataract, Michigan her timber and ores, the great Mississippi valley its productive soil, Colorado her precious metals, Montana her copper, California her orchards and vineyards, Newfoundland her fisheries, New York her command of an ocean's commerce, but Washington has in profusion each and all of the resources and opportunities, one or more of which have made these sections famous, but which are nowhere else found in combination. Among the states of the Union are some which thrive upon agriculture; others are industrial commonwealths devoted to manufacturing; others are distinguished by their commercial and maritime activities; in some fisheries are a source of wealth; forests have yielded their timber to the wealth-producing activities of others; mines of coal, iron, copper, lead, gold and silver have been developed in many almost uninhabitable regions; sheep and cattle graze on many a plain or hillside where water is none too abundant, and where the winter's snow and cold are hard to endure. Washington yields more bushels of wheat to the acre than any other State in the Union. The fleeces of Washington sheep are the heaviest grown in this country. The apples, peaches, prunes, berries, grapes and other fruits and vegetables are the most luscious that are produced anywhere. The forests of Washington yield the largest timber found in the world, excepting only the vanishing redwood of California. Washington has the richest coal deposits this side of Pennsylvania. Copper, iron, gold, silver, marble, granite, sandstone are found in abundance. Salmon, cod, halibut, cod, sole, herring and a great variety of ocean fish mountain trout, crabs, oysters, clams, shrimp, abound in the waters of the State. The great inland sea, the land-locked harbor of Puget Sound with its sufficient depth for the greatest vessels afloat, and with many spacious harbors, commands the shortest ocean route between the United States and the Orient, and insures to Washington the maritime supremacy of the Pacific. Cheap and abundant power for manufac-

turing, and a great diversity of raw materials, have already made Washington a great industrial commonwealth. The climate of Washington is the most equable and salubrious in the United States. Neither extreme heat nor cold is ever experienced west of the Cascade mountains, and Eastern Washington has mild winters and comfortable summers. The scenery of Washington is sublime. The loftiest mountain peak in the United States, exclusive of Alaska, towers to a height of nearly three miles within sixty miles of tidewater. The Olympic peninsula is rugged and mountainous. Nature's beauties are nowhere displayed more effectively. Washington has everything to make life comfortable and people happy in legitimate pursuits. There is no limit to the possibilities of its development. Its ocean commerce reaches to the ends of the earth. The great transcontinental railways of the country have either extended to Puget Sound or are determined to do so. Puget Sound is the gateway to Alaska and the Orient.

The population of Washington in 1860, the first census that was taken after the creation of Washington Territory, was 11,594. In 1870 the population had increased to 23,955. In 1880 there were 75,116 people in the State. In 1890 the population was 349,390; in 1900, 518,103. The population of the State has increased with great rapidity since 1900, and is now estimated by the State Statistician at 825,000. Large and rapidly growing cities have sprung up. Seattle, Tacoma, Spokane, Bellingham, Everett, Walla Walla, North Yakima, and the capital, Olympia, are the leading cities of the State. Aberdeen, Vancouver, Ballard, Puyallup, Ellensburg, Colfax and many other towns are growing rapidly and will develop into important and populous communities. The area of Washington is 69,180 square miles, of which 66,880 square miles is land surface and 2,300 square miles water surface. As yet, however, notwithstanding its growth in population from 11,594 to 825,000 in forty-five years, with 750,000 increase in the last twenty-five years, the development of Washington has only just begun. The surface has only been scratched here and there. The next twenty-five years will witness a marvelous increase. The great factors in the growth of Washington will be irrigation, manufacturing from the native products of the soil, the forests, the mines and the waters, and railway and ocean commerce, by which Washington is in direct touch with all parts of the world. Washington is the State of Opportunity. It invites the farmer, the miner, the fisherman, the stock raiser, the manufacturer, the trader, the capitalist, the transportation companies, to enter its field of limitless activity. It has rewards in store for every kind of honest and intelligent effort.

**Send \$2.50 for The Irrigation Age
1 year, and The Primer of Irrigation**

PUMPING WATER BY COMPRESSED AIR.

BY EMMET BARBER, C. E., TULARE, CAL.

The great demand of the arid region of the world is how to obtain water for irrigation. Very few sections have sufficient water from the rainfall and snows in higher altitudes, and are compelled to use methods of obtaining water below the surface of the earth.

The method of lifting water by machinery has been a great study for the irrigationist, and only the most

is the Waukena Colony Company's tract of land comprising some 13,000 acres.

The soil on this land runs from six inches to four feet deep and when irrigated will produce wonderful crops. Many schemes have been advanced to produce artificial irrigation at reasonable cost. Nothing, however, was done until the Compressed Air Machinery Company of 24 to 28 First street, San Francisco, offered to install an air-lift pumping plant that would raise 240,000 gallons of water per acre, at a cost not exceeding \$1.10 per acre.

This offer was accepted by the owners of Waukena Colony Company's ranch. The plant has just been completed and tested often enough to prove that it can raise, out of the wells on the Waukena ranch, 27,154 gallons of water per minute, which is one inch deep on an acre of hard surface, for the sum of eight cents, or seventy-two cents for nine inches.

The next part of the plant to be installed will reduce the above cost to sixty-three cents to cover an acre of land with 240,000 gallons of water.

After six years of experience with air-lift pumping plants at various points in New Mexico, Arizona and California, we can cheerfully and truthfully say that there is an abundance of water in the San Joaquin and Southern California, where the above results can be duplicated.

You will notice we do not mention size of plants, horsepower, and general construction. This information will be given to parties interested in the purchase of plants. The most important item to the general public is: What will it cost to raise a number of gallons per



Natural flow of Artesian Well at Waukena, Cal.
[600 gallons per minute.]

profitable crops would pay for lifting at a greater depth than thirty to fifty feet. All kinds of devices have been invented and used, sometimes at a great expense.

The advancement of all kinds of improved lifting machinery has been rapid during the past twenty years in the United States, but the invention and perfection of lifting water by compressed air has been of recent date.

On May 6, 1904, I went to inspect a compressed air plant of which I present four views herewith, the demonstration being quite satisfactory, from which I made the following notes and estimates.

The power furnished being a 75-horsepower boiler with a 35-horsepower compressor; fuel used, Kern River California crude oil, about 14 gravity; each compressor is expected to furnish air sufficient for four wells, and the power of the boiler is sufficient for from two to three compressors.

At the time of examination the compressor was connected with two wells, one artesian and one surface well. The artesian well was 865 feet deep and had an estimated flow of 600 gallons per minute before the compressed air was turned on, which increased to about 2,400 gallons per minute after the air was applied, which ran into a ditch with a four-foot bed, slope two to one, on a fall of 1 in 800, which increased from four inches deep before the air was applied to ten inches deep after.

The following is the report of the construction engineer of the above described plant:

Situate at Waukena, which is about twelve miles from Tulare, Cal., and twenty miles from Hanford.



Same Well after Compressed Air is Applied.

minute, based on the cost of fuel where the work is to be done.

The above estimates of cost were based upon Bak-ersfield crude oil at seventy cents per barrel f. o. b. Waukena.

This plant when completed is guaranteed to cost \$16,000 and irrigate 13,000 acres of land at an annual cost not exceeding \$1.00 per acre, and will consist of eight compressors with capacity of four wells for each compressor.

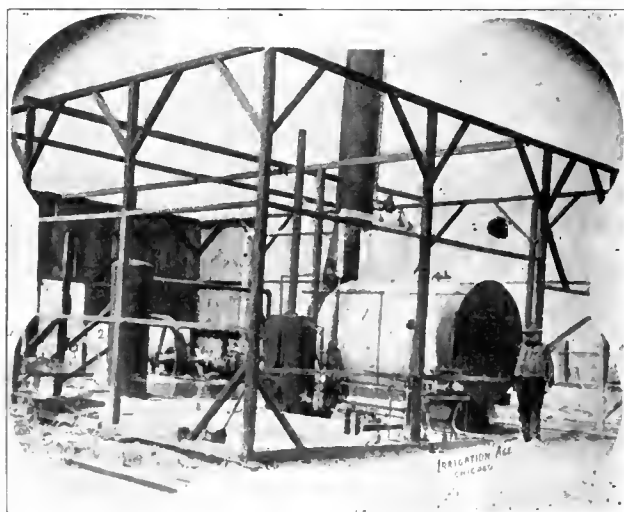
Should this plant prove a success it will revolutionize the system of raising water by artificial means



Water Lifted 10 Feet High by Compressed Air.

profitably from a depth of 150 feet by large plants, and will enable those having artesian wells to increase their flow from two to four times the natural flow.

I am watching with much interest the success or



Boiler and Compressor.

failure and will report to THE IRRIGATION AGE the results.

THE INGLETON STEAM PLOW.

BY GEORGE CALVERT.

The labor involved in raising a crop is the principal cost and if the expense of the labor necessary for the planting, cultivation and harvesting is reduced one-half through the employment of new methods then the market valuation of the crop is proportionately reduced so soon as other general competitors adopt the same methods. This is not only true in agricultural pursuits, but in every other branch of labor the same revolution of previous conditions takes place with the introduction of labor saving machinery. If, for example, the actual cost of producing a bushel of wheat by the ordinary manner of cultivation is fifty cents and the market price is seventy-five cents, it can not be expected to maintain the selling price at the same figure, if by new methods the actual cost of growing is reduced to twenty-five cents per bushel. Competition is bound to ultimately force down valuations on such products to a defined legitimate basis.

No other industry in this country involves such large monetary interests as that of farming, yet farming machinery is still in a crude state of development. The fact is, that while the United States sells farming implements in large quantities to every country on the globe, the field of invention offers varied opportunities in the perfection of this class of machinery.

The accompanying illustrations show the possibilities that have been recently attained in a machine for plowing land. This steam plow, named after its inventor, Ingleton, will be placed upon the market at an early future date. The successful operation of this ingenious apparatus was fully demonstrated several years ago in actual plowing tests, and its practicability was not found wanting in any particular. At the St. Louis Fair the Ingleton plowing outfit was on exhibition and received a special diploma for excellence and perfect operation.

It has a capacity of plowing a series of furrows in one cut across a field fifty feet wide; thus the economy from its use can be fully appreciated. The machine possesses radically novel construction over other steam plowing outfits heretofore designed and tested. The principal departure from the general type is the operations of the plows themselves, which work in a direction at right angles to the course of the engine. The plow apparatus consists of a steel frame of the desired length (30 to 50 feet) mounted upon a series of rollers and attached to the rear of a heavy traction engine by suitable steel arms. Upon the steel frame are mounted a series of carriages running on wheels which traverse the circuit of the frame. Each carriage carries a shank mounted in a vertical slideway; to the lower end of the shanks are attached the plows. The slideway construction permits the plows to rise and fall in order that they may accommodate themselves to the undulating surfaces of the land. This arrangement is essential to the proper working of the apparatus, as in plowing a strip fifty feet in width in one operation the plows would not conform to the unevenness of the land if rigidly affixed to the frame. The power for driving the plowing mechanism is obtained from one of the rear axles of the traction engine and transmitted to a crank shaft on the frame by means of a link-belt chain. Connected to this shaft is a second chain which

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Ingleton Steam Plowing Outfit.

transmits the power to a shaft mounted upon one end of the frame, which in turn contains a third chain encircling the frame and connecting all of the plow carriages. This system of gearing is an important consideration in the operation of a heavy apparatus of this character, as the severe strains, naturally devolving upon the engine in its ordinary operations, are diminished to a minimum.

The forward speed of the outfit under normal conditions is about one-half mile per hour, while the speed of the plows around the frame is between three and four miles per hour; thus the maximum speed of the plows is secured at a minimum tax on the engine. The outfit is capable of plowing approximately three acres of land per hour under the above mentioned speed, which is about three times the capacity of a train of four gang plows operated by a 20-horsepower engine.

A special feature worthy of mention in the construction of this ingenious apparatus is the rollers which serve advantageously in mashing down all stubble and trash that may be present on the land, thereby preventing the plows from becoming choked. The plows are adjustable to any desired depth and by changing the mould-boards either "breaking" or stubble plowing may be done with equal ease and facility. C. A. Hall, North American building, Philadelphia, Pa., who is now undertaking the manufacture and export of these implements, states that the outfit is an assured mechanical success and it will eventually supplant all other plowing apparatus now employed upon the large farms of the West.

A WISE DISCLAIMER.

The National Irrigation Congress is to be congratulated on the forthright declaration that separates it from all connection with the so-called National Irrigation Association. The recent session at Portland included among its resolutions the following statement:

"This Congress calls attention to the fact that there is not nor has there been any connection whatever between the National Irrigation Congress and the incorporated company known as the National Irrigation Association, and it is hereby announced that no corporation or company has been, or is, authorized to solicit or collect money for or in behalf of the National Irrigation Congress.

So far as past time is concerned, the resolution does not cover the facts, unless in a technical sense. The officers of the National Irrigation Association were for several years in practical control of the National Irrigation Congress, and the connection was one of substance if not of form. The connection proved anything but fortunate for the Irrigation Congress. The National Irrigation Association has been made up of men who had personal rather than public interests to serve. It was developed during Congressional hearings that this association was receiving a subsidy of \$30,000 a year from certain corporations, and it was plain that the usefulness of the National Irrigation Congress must come to an end if such influences were allowed to control it. They are not now in control, and we trust that they never will be.

The Congress could not be too emphatic in repudiating any claim to a connection between the two bodies, and we are glad to see that it recognized the fact. —*Water and Forest*, San Francisco, Cal.

MORE ABOUT MONTANA.

Billings and the Country Surrounding.

The lust for land that since Adam was driven from the Garden of Eden has dominated the human race has turned the tide of emigration ever toward the setting sun. "Westward Ho" has been the shibboleth of the pioneer for a thousand years and today opportunity still beckons from the West and the men of the East are flocking to the coast and the great intervening so-called arid belt in greater numbers than ever before.

Not until the enterprising citizens of Portland succeeded in floating their great enterprise for an exposition that should eclipse anything ever before attempted in the West has the Eastern man had an opportunity to see gathered together the wonders of the Trans-Mississippi country. It was in the line of education for the man

dens that it is possible to conceive and to know that it is the magic touch of water that for ages has gone its uninterrupted course to the sea that has caused the change made the visitor a convert to irrigation. There is still a little of the old West left. When this is gone, when the restless hordes from the East have swept over this region and filled every nook and cranny that can support human life, what then? Will the tide of travel turn backward and sweep back over the East? It is a problem for future generations to grapple with—what is of more vital interest to the present generation is the fact that there is still room for thousands of homes in this wilderness, there is still room for the manufacturer in search of new markets, for the merchant with a stock of goods, the practitioner who is seeking a location and for the young man who wants to grow up with the country. In searching for a new home, it is the wisest plan to follow the course of least resistance. The land that



A Montana View.

from the eastern or middle states to take advantage of the cheap railroad rates offered by the trans-continental roads and visit that fair. He passed through a sparsely settled country where the homeseeker still has a chance to take up land under the homestead act and carve a home for himself out of the wilderness; he traveled over mountain ranges of untold riches in mineral only awaiting the blow of the prospector's pick; he passed over plains that are gradually being transformed from sagebrush deserts into vistas of emerald beauty; he saw great inland waterways that are being navigated by giant steamers, and rode in trains that rival the finest the East can produce, he observed cities and towns springing into being where he imagined were merely Indian villages or at best the crude trading posts of the early West. There was much to be seen at the fair, but the observant traveler who took plenty of time to make his journey and note the conditions of the country just east of the Rockies learned much that is overlooked in the chronicles of the day—the splendid growth and development that has followed the "irrigation boom" in the arid belt of Montana, Wyoming and Colorado. To have seen these beautiful valleys transformed into the most fertile gar-

offers the greatest opportunity for the least money and has the readiest markets will always get the settler.

The tourist who traveled west via the Northern Pacific was in a fairly well settled country until he reached the western part of Dakota. There the landscape was forbidding, the "bad lands" making an artistic background for a Western picture but hardly arousing enthusiasm in the breast of the born farmer. It was not until the Montana line is crossed that the country took on an interesting appearance. At Glendive the traveler strikes the lower Yellowstone and from there to Forsyth one sees an occasional farm that is doing well under a ditch, but the greater portion of the broad valley is given over to the pasturing of immense flocks of sheep. Near Billings a change for the better is noted, and if the traveler made his trip in early summer he saw a valley that was once covered with bunch grass dotted with beautiful homes, surrounded with blossoming fruit trees, corrals full of fat stock and fields of waving alfalfa and grain stretching away to the bluffs that shut in the valley on either side. It is one endless panorama of prosperity and plenty and most marvelous of all the transformation has been made in less than a decade. Even today-

there is still plenty of "elbow room" for the newcomer. And yet it was only twenty-nine years ago that Sitting Bull and his savage Sioux devastated this very valley and met Custer a few miles south on the banks of the Little Big Horn and annihilated his brave band of followers. The Custer battlefield is one of the show spots of the West and the government has turned it into a great national cemetery, with a marble shaft marking the spot where each dead hero was found. Surrounding the battlefield are the farms of the peaceful Crows, many of whom took part in that memorable massacre. They have buried the hatchet forever and are today earning their living by honest toil.

The Custer battlefield marks the center of the great Crow reservation, a portion of which is to be thrown open to settlement soon. Uncle Sam has opened an office at Billings, where the work of reclamation of the valley lands within the boundaries of the ceded strip is being directed. A corps of engineers is now in the field running the lines for the three great irrigating projects that are to be completed before another year passes. When the great canals and the laterals are completed

the initiative in the reclamation of the Northwest. Private enterprise has accomplished much more and that in the face of untold obstacles. Within a radius of twenty-five miles of Billings there are seven great canals aggregating over 200 miles in length that water over 100,000 acres of land. One of these has only recently been completed and covers what is known as the Huntley flats. This great valley lies partially in Yellow-



Cutting Oats in Yellowstone Valley, west of Billings, Mont., on Ranch of Mr. Westbrook.



Photo showing 41 Stacks of Hay on Hesper Farm, owned by I. D. O'Donnell, near Billings, Mont.

over 200,000 acres of the choicest land in the whole Northwest will be ready for the plow.

Uncle Sam is the greatest real estate dealer on earth. He has been a long time in the business and he clings to old methods with a hopeless tenacity, but he has learned a good deal from his experience in Oklahoma. There will be no mad rush such as was experienced when that stampede took place, no confusion, no hardship. The homeseeker who wants a farm in the Crow reservation will register at Billings when the government land office is opened, and await the result of the lottery. If he is lucky enough to win a prize, he can take his time at going in and making a home for himself. The land will not be free, for he will, in addition to exercising his homestead right, have to pay the government \$4 an acre for his claim. He will pay \$1 down and have three years in which to make final payment, and will then get his patent to the land. If he is lucky enough to get a claim under the ditch he will have to pay his share for the maintenance of the ditch, as Uncle Sam is spending about a million dollars in building ditches and practically makes the settler a present of land easily worth \$50 an acre.

But it has not been left to the government to take

stone County and extends into the Crow reservation. The government is reclaiming that portion of the flats that lies within the ceded strip and it will be open for settlement soon. In this valley alfalfa grows to a height of six feet and three crops can be cut each year. Potatoes that rival the finest product of Colorado, both for size and delicacy of flavor, run as high as 500 bushels to the acre. Grains of every sort can be successfully grown and fruits that are finer and



Band of Sheep on Range near Billings, Mont. [Property of Jos. Elliott.]

larger than are shipped from the West flourish in this valley. There are 75,000 acres in the valley, 30,000 acres of which are owned by private companies and individuals; all of this land, however, is not under cultivation at the present time. The vanguard of the homeseekers is already on the ground to learn the country thoroughly before the great influx of

immigrants begins. As the natural center for all of this great undeveloped section, Billings is emerging from its frontier clothes and putting on the airs and habiliments of a city. New industries are being exploited. A million-dollar beet sugar factory has been successfully financed. It means that nearly a million dollars a year will be distributed among the farmers of the reservation and the valley. A "thousand-cow"

what is known as the old ditch company. This ditch was subsequently sold to the farmers under it and at the present time supplies water for 120,000 acres of land.

Mr. King first broke four acres, which were planted to potatoes, corn and other garden truck. The first crop was entirely destroyed by grasshoppers. The following year he was more successful and saved his crop



Another Montana Scene.

creamery is also in successful operation. An industrial era is under way that will make this the center of one of the great agricultural and manufacturing sections of the West.

We are presenting in this issue an illustration showing the home of Mr. Charles King, a prosperous rancher in the Yellowstone Valley near Billings; Mr.

as well as breaking twenty acres additional, which were sowed to barley and oats. With additional irrigation he forced the native grass so as to produce fodder for his team and slowly added to his cultivated tract until 1888, when he cut and baled 120 tons of hay, which was sold at an average of \$17 per ton, this unusually high price being the result of a failure of



Threshing Oats on Ranch of W. W. Clark, Huntley Flats, near Billings. Six months ago this land was a desert covered with sage brush.

King settled in that section in 1881, choosing a quarter section of government land eighteen miles west of that city. Mr. King had no money when he reached Billings and worked by the day for a time, purchasing a team on credit. He secured water for the land from



Scene at Ranch of Charles King, Laurel (near Billings) Montana.

the Utah hay crop. Later on, owing to the fact that the price of hay was going down, he plowed under his meadow and sowed the land to oats and subsequently, in 1901, had the good fortune to raise the champion crop of oats. One particular acre, especially measured, raised 150 bushels, while the whole field averaged 100 bushels to the acre. Mr. King realized \$40 net for

each acre planted. He states that land can not stand that sort of a bumper crop each year; it is necessary to summer fallow, keep ground clean and work it thoroughly. He also states that the theory that irrigation keeps soil up is a fallacy. Mr. King has acquired more land and has one 200-acre farm rented to the sugar beet factory for a period of five years at an annual rental of \$10 per acre.

In further conversation with the writer Mr. King stated that his old or original ranch is now sown to alfalfa, with the exception of sixteen acres, which is an orchard. He raises alfalfa for seed and can usually harvest about five bushels of seed per acre, sixty pounds to bushel; this sells for 12 cents a pound, or about \$36 per acre; the only cost in raising alfalfa seed is in the harvesting and hulling.

In 1891 Mr. King made a record in potato raising for the Yellowstone valley. He selected an acre of ground and put on it in piles sixty tons of well rotted

so that all that was in course of preparation near the hills went into the potatoes.

Mr. King is a typical Western rancher, but is a good bit of a student as well. In showing the writer a fine bunch of apples taken from his orchard he said, "I know every stem on those apple trees; I watch the apples grow in clusters and crowd each other for place just as do grapes in a bunch. I know," he continued, "every horse on my ranch and they know me and will come at my call as far as my voice will carry."

Mr. King, whose picture is shown in the half-tone standing back of the cultivator, said, in concluding our very pleasant and interesting visit: "A farmer's life may be a little lonesome sometimes, but it has its compensations."

If any of our readers visit Billings they will do well to meet and become acquainted with Mr. King.

Our December issue will tell more about the farmers near Billings.



Scene near Billings, Montana.

cow manure; this was distributed in piles ten feet each way. He then plowed the land and made furrows with a two-horse walking plow eight inches deep and planted seed in every third furrow one foot apart, selecting large seed with two "eyes." He then covered the seed with manure and plowed under. It took a long time for the seed to sprout and come to the surface, but about all of the seed grew. The crop was then plowed, hoed and irrigated when he thought necessary. The vines made remarkable growth, were long, thick and large, and covered the ground so that cultivation was stopped. Mr. King states that an early frost nipped the ends of the vines, and as a matter of curiosity he dug one hill to find how much the potatoes would weigh, fearing that they had all gone to vines. The potatoes in the hill opened weighed about three pounds. A remarkable change was found after the frost, as every hill opened later in the season after the vines were frost killed showed a weight of over ten pounds. He attributes this remarkable difference in increase of weight after the frost to the fact that no more plant food was required by the tops after the frost

AN ANNEX 'TO WONDERLAND.

Proposition to Build Wagon Road to Yellowstone Park by Way of Red Lodge Meeting with Favor.

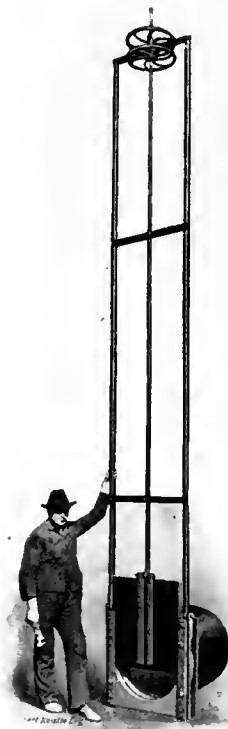
The Red Lodge route to the Yellowstone Park may be a reality within another year if the united efforts of the Red Lodge Board of Trade and the Montana Business Men's League bear fruit. In order to demonstrate the feasibility of this route, an overland trip was made a short time ago by Albyn Buchanan, secretary of the League, in company with a newspaper man, a photographer and several business men of Billings. The Red Lodge organizations furnished the guides and Sheriff Potter acted as host. Over 100 photographic views were made en route and data collected that will be presented to the congressional representatives and the Department of the Interior. As the road will pass through the Absarokee Forest Reserve and connect with the Soda Butte road in Clarks Fork Canyon, the aid of the government is necessary. Some opposition at the hands of interested parties is expected, but as both Red Lodge and Billings

are united on the project, it is certain to win out. Carbon county has built fifteen miles of the road already and its engineer is making a survey of the extension now. The road will pass through the majestic gate to the mountains near Red Lodge, thence up the Rocky Creek Canyon to where it heads at Mirror Lake. From the summit beyond this is the greatest panoramic view in America and over twenty mountain lakes are visible. The route takes one past the famous Frozen Lake, the Chain of Lakes, Bear Tooth Lake and Peak and the old Hudson Bay fortifications. From here on there is a succession of grand parks until the beautiful and impressive canyon of the Clarks Fork is reached and the Soda Butte road is tapped. On this road are the Amethyst Mountain, the Petrified Forest, the Soda Butte Springs and other freak features not on the regular line of travel. The road when complete will be about fifty miles long. The Red Lodge road will add about two days to the itinerary of the park visitor who prefers to see the sights at his leisure and in his own way.

It is to be hoped that Montana's representatives in Congress will lend the measure their united support, as it is a deserving one. The Yellowstone Park is the people's playground, and there can not be too many wagon roads leading into it.

THE NORTHWESTERN HEADGATE.

The headgate shown in the accompanying illustration shows the Northwestern Iron and Steel Headgate, with 24-inch opening and 18-foot frame. This



gate is hinged so that the frame may be dropped under water in the reservoir during winter to prevent ice packing and carrying the gate away. This is only one of many special headgates made by C. D. Butchart, of Denver, Colo., whose advertisement appears on another

page, and to which IRRIGATION AGE calls attention. Owners of reservoirs should send for Mr. Butchart's catalogue.

A NEGLECTED OPPORTUNITY IN ARID RECLAMATION.

While the Government and private capital are searching out reservoir sites, another and less costly means of reclamation lies unseen. This lies in the non-provision of water tight conduits for the sinking rivers and creeks of Idaho and other arid States.

A sinking stream is one which cuts through the soil and wastes down through the gravel. A stream of this kind will lose its entire volume in flowing a few miles. A certain creek in southern Idaho, in which measurements were taken, was seen to lose nearly half its volume in flowing across a forty acre tract. Excavation has, in many instances, shown the gravel interstices unfilled save by a thin coating of dust on the upper surfaces of the boulders. This will give an idea of the extreme porosity underlying the beds of such streams.

Along the northern border of the Snake River desert a score of such streams flow down from the mountains, but soon disappear through the gravel into the underlying lava beds. They do not irrigate a tithe of the acreage which they would could their total volume be saved. As much is probably true of like streams in other arid states.

The diversion of canals from these streams, where the canals do not bed too near the gravel, effects an appreciable saving of water. It is, however, a matter of less waste in the canals, compared to greater loss in the natural channels. Moreover much is lost in the natural channel before the point of diversion is reached. What is needed is the diversion of the entire stream above the point where the water commences to waste, and its conduction through a water tight canal the full length of the cultivated area.

It would require a less outlay of capital than do the great reservoirs. A certain stream in southern Idaho could be carried two miles through a lumber flume, costing a few thousand dollars, deliver water to several diversions, and send several hundred inches to the valley, where it is much needed. This, however, is an exceptional instance. For canals extending several miles, water tight construction would be more costly. Again, in other localities a canal excavated in the natural earth would be sufficient. On Raft River, Idaho, a diversion of one hundred and sixty inches is carried through a ditch for nine miles without loss, where it would entirely disappear in flowing two miles through the natural channel. This is because the soil is from fifteen to twenty feet deep, so that the porous gravel is many feet below the ditch bed.

Not every site that is favorable to the construction of a dam, and to the retention of a large volume of water is available as a reservoir. However, there are few streams that would not profit by water tight canals. Often such canals would profitably supplement the capacity of the reservoirs for reclamation.

It is not improbable that the government engineers are already taking observations on the sinking rivers and creeks with a view to saving the volume thus lost to irrigation.

THE ESCALANTE DESERT.

BY WM. H. WILE JR.

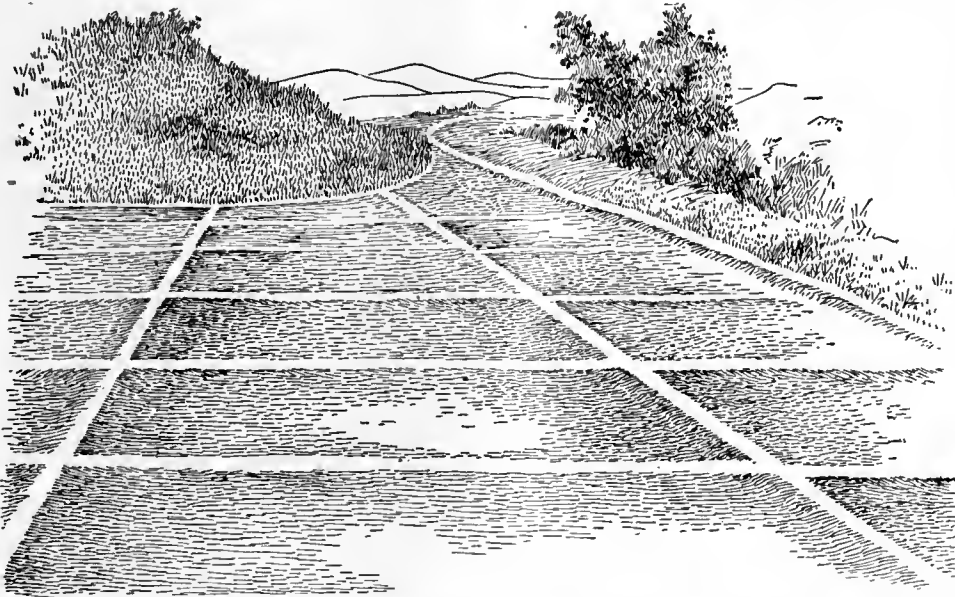
This vast arid expanse of Southwestern Utah is comparatively unknown to the outside world.

Walled in by snowy mountains this wonderful land of sunshine and sage flats has marvelous possibilities for development. Bounded on the east by the beautiful Cedar and Parowan ranges—spurs of the mighty Wasatch, and on the west by the endless desert ranges of Nevada—the San Francisco Mountain of myth and legend, this great desert rises toward the south, to sink away through mountain passes into the alkaline wastes of Nevada, and slowly falls toward the north. The Wasatch Mountains, which run from north to south throughout the central part of Utah, present an enormous monoclinical uplift which gradually falls away at a low angle toward the east and breaks off abruptly at the west.

Hence the western slopes of the Parowan and Cedar

raspberries of the most delicious flavor are found on the very tops of these ranges where the winter snow has left the rich, black soil exposed.

Most people imagine a desert to be a vast level expanse of sand, on which nothing lives, not even plants. Few deserts fulfill these conditions. All our American deserts are inhabited by a rich fauna and flora. The desert plants and animals, like the desert people, have adapted themselves to the conditions, in a wonderful way. Those animals who have been able to exist on the desert have become stronger and more active, often larger. They have had all their faculties sharpened to a wonderful degree. They are more keen and alert in avoiding their enemies, simply because they have had great difficulty in obtaining food and those who have been less keen and active have perished. The desert wildcat is very much larger, stronger and more ferocious than the ordinary wildcat of the forest and the river valley. The jack rabbit, whose flight resembles that of an arrow more nearly than anything else, attains a



Land laid out in Basins. [An illustration taken from the Primer of Irrigation, fully explained in chapter 13 of that work.]

Mountains present toward the desert mighty cliffs, and rock masses, grand canyons and rock walls rising thousands of feet perpendicularly. At their bases bare and gaunt rocks, splintered and shattered by the vast extremes of temperature to which they are subjected, present a great variety of color. Every shade of red and yellow, with delicate tints of gray contrasted with the gorgeous blue of the sky, or the marvelous colors of sunset or sunrise enchants and charms the eye.

Above the rock faces, the range rises less steeply and is clothed with small, stunted trees, mostly pinion pine, which with grasses and sages, gives a green appearance to the mountain flanks. A vast and wonderful country is found on top of the range extending back to the main ranges of the Wasatch.

Prosperous farms are sometimes found in some protected amphitheater at the base of some vast snow deposit, whose size enables it to last from season to season. Beautiful meadows, nurtured by the loving care of Nature, are found at other places. Tender flowers more delicate than those reared by man bloom unseen in these garden spots. Fields of large wild mountain

size and speed on the desert not found elsewhere. His wonderful constitution enables him to live from year to year practically without water. Indeed, it is said he never touches water. I have seen hundreds of these beautiful creatures skim lightly, gracefully, with great bounds, across the desert, scattering in every direction from the wagon road as we approach. Antelope and wild horses are occasionally seen in the distance. But the king of the wild animals found on the desert, and the most dreaded, is the dull brownish yellow desert rattlesnake; they occasionally invade your tent and curl up under your stove, ready to strike you unawares, but always with the terrible rattle. Besides the wealth of animals and plants on the American deserts, there are rolling hills and mesas and vast rocky buttes, and mountains covered with stunted trees. What may seem more strange, there are at times violent rain and thunder storms, and in winter fearful snowstorms.

And just as the animals have undergone a transformation, so have the men become a strong, vigorous, active race. Carlyle's words speaking of the desert certainly apply here: "Consider that wide waste horizon

of sand, empty, silent, like a sand sea, dividing habitable place from habitable. You are all alone there, left alone with the universe; by day a fierce sun blazing down on it with intolerable radiance; by night the great deep heaven with its stars. Such a country is fit for a swift-handed, deep-hearted race of men." Utah is truly a land of "great, grim deserts, savage, inaccessible rock mountains, alternating with beautiful strips of verdure; wherever water is there is greenness, beauty; odoriferous flowers and shrubs, fruit orchards and waving poplars.

Scientific irrigation is the secret of Utah's prosperity. The vast social organization which has reared the great Mormon Temple at Salt Lake City, perhaps the most imposing single edifice in America, owes its existence to irrigation. The Mormon pioneers in 1847 turned the mountain streams upon the alkaline desert and cultivated the virgin soil. This was the first effort of the Anglo-Saxon race to reclaim desert lands, with

under present land laws. The problem of administration, which we do not propose to do more than hint at, also presents vital issues. (1) Shall development be by the State or (2) by public corporations or (3) by private enterprise, operating under restricted grants from the State. These are all important problems before the country today, and must be answered largely according to local conditions. In the final analysis irrigation as an economic problem is composed of five parts, as Mr. Brough, in an article on "Irrigation in Utah," points out:

- (1) An adequate water supply.
- (2) Suitable lands to put it on.
- (3) Efficient and lasting works for delivery and distribution constructed within economic limits of cost.
- (4) Fair and efficient management of these works in the interest of the consumers under them.
- (5) A contented, industrious and skillful population of irrigators located on the land.



Orchard Irrigation. [One of illustrations used in the Primer of Irrigation.]

the exception of the flooding of the rice farms of South Carolina. Much remains yet to be done before the system will have reached anything like the perfection aimed at. Not only in the Escalante desert region, but all over Utah by far the largest amount of the annual water supply runs to waste, all the water is entirely lost except that flowing during two or three months of the irrigation season. The Escalante Desert is underlaid by vast quantities of alkali water, which can easily be pumped to the surface. As we have said, irrigation has reared this vast social fabric out of the dust. Its cost has been over \$563,000,000 and \$20,000,000 would be a very liberal estimate of the value of personal property brought into the territory. This is the economic argument in justification of the reclamation of arid land. Where irrigation is practical various problems arise as to (1) whether the Federal government shall appropriate money and enter upon the reclamation of its arid public lands, or (2) whether it shall cede the public domain to the States either unconditionally or with such conditions or limitations as would secure this land to homeseekers or (3) that the land shall be reclaimed

Many sections of the Escalante region fulfill these conditions and have been converted into garden spots. Such are the beautiful towns of Parowan and Cedar, where the State Normal School is located.

But even more important than irrigation with its wonderful possibilities in this section of Utah, is the wonderful natural deposits of iron and coal, particularly the former in Iron county. The marvellous resources of the Iron Mountain region, situated in the very heart of the Escalante Desert will soon be revealed to the world in a volume of the annual report of the United States Geological Survey. My work on a leveling branch of the Geological Survey gave me opportunities to study these marvelous deposits. Professor Newberry says of this so-called "Iron Mountain": "These deposits are probably not excelled in intrinsic value by any in the world. There are certainly no other deposits to compare with them west of the Mississippi for the manufacture of pig and bar iron and steel, and it would be difficult to estimate the influence they would have on the industries of the Pacific Coast." Another eminent expert says that Utah's iron resources much exceed those

of any other section of the Union. The recent completion, May 1, 1905, of the Senator Clark line—the San Pedro, Los Angeles & Salt Lake, through Southwestern Utah and Nevada, has opened this country to the rest of the United States. Hitherto the situation of these rich deposits, far distant from rail communication and source of demand for manufactured iron products, has prevented Eastern capital from becoming interested to any large extent.

A tremendous trade in iron products from Southwestern Utah is bound to arise over the San Pedro line via the port of San Pedro with countries beyond the Pacific.

John T. Jones, a metallurgist in the employ of a Pennsylvania syndicate, asserts that he finds in Iron county a body of iron that will aggregate 400,000,000 tons. There is water in the Rio Virgin River for all the needs of great iron factories and every other natural element, such as coal and lime, for the economic reduc-

more in the sun. Indeed, it is said that on some parts of the Sahara water will freeze at night, and an egg will cook on the burning sands by day. This is due in large measure to the rapid cooling of the sand and the loss of heat to the cold outer space, there being no blanket of vegetation to retain the heat of day. This is also due in Utah to the elevation, the whole desert being over 5,100 feet above the sea level, the air is rarified and can not retain the heat of day. However, I do not think I have ever experienced such a balmy, delightful breeze as blows up the desert from the south at night, removing all sensations of weariness or fatigue which the burning sun creates. There is something grand about sleeping in the open air under the canopy of the heavens, with this glorious night air blowing in your face. The vast expanse of sky and its far away meeting with the desert gives a feeling of freedom and serenity. In the pass which we have spoken of there is a beautiful spring of water which bubbles out and forms a mud



Irrigation by Flooding. [From Primer of Irrigation.]

tion of iron is at hand. This is just south of the desert in Washington county.

Leaving the palace cars of the San Pedro line at Lund one crosses the desert by the stage route through the pass in the very heart of the Iron Mountains to Cedar, some thirty-five miles distant. Lund is a palatial desert town, composed of two or three little wooden shanties, a well of filthy alkaline water, and the railroad station. It is an important shipping point for cattle, which are driven in here from all directions and sent to Omaha. Four to five thousand head of cattle are sometimes shipped from here in a single day. It is a marvelous sight to see these vast herds of cattle being concentrated from all quarters of the horizon, midst clouds of dust, in the pens at Lund.

Working on the desert is attended with numerous difficulties and hardships, not only on account of the vast ranges of temperature, but also on account of the terrible dust storms which continually arise and render leveling work impossible. I have often noticed a temperature of 40 early in the morning and a temperature of 96 in the shade toward noon, and 150 degrees or

canyon below. Much of it is used for irrigation by the Roots, who have established their home there, and the rest is dammed up in several little ponds. Climbing the Iron Mountains to the north of the pass we pass rows of little low cedar trees resembling orchards and see occasionally little round chambers, with narrow openings, in the cliffs. Right in the center of these hills to the north of the pass appears an enormous outcrop of iron. The richest sort of magnetite and hematite exists in compact masses of thousands of tons. The enormous pinnacle of iron rises fifty to a hundred feet in the air. It has given off lump after lump, which has fallen down, forming an extensive talus formation at the base or has rolled down the hill far away. Forming almost an amphitheater around these iron outcrops rise the peaks and huge crags of these typical desert mountains. The level floors of the ravines are decked with the blue gray sage which grows amid the rocks everywhere, the coppery grey greasewood, with here and there a dark green cedar. And now and again the pretty little peeps greets the eye with its bright little red flowers, interspersed with the silvery, pinelike leaves of the

soft and tender white sage. Quite frequently the green mass of the yellow sage, with its amber colored seed pockets, where beautiful yellow flowers have bloomed, is met. The beautiful white snake flower, with its soft, white petals and dozens of yellow stamens, and thick green, hairy calyx; and the large ouse, with its long, green, lilylike flower stem and its little white bulblike flower and its long, green leaves springing out of the central bulb, at once charm and delight the eye. And over the barren floor everywhere is the curly grass and tosslers grass, and the little low, white daisy, with its matlike forms. As we descend the masses of yellow brush and rabbit bushes and the little low deer brush and the pretty little white pig brush are passed. Midst rocky mass and canyon floor the path descends to the valley. Truly the desert flora, as well as the fauna, is rich and varied.

Mountain and desert alike exert a fatal fascination over the souls of men, compelling them with an irresistible power to return to their mighty glaciers and snow fields, or burning, desolate sands. "In the presence of these vast spaces and all but unbounded outlook, the hours hurry by with singular swiftmess." No one has as yet attempted to answer, in any detail, the psychological effect on the personality of the vast desert, nor to explain that "expansion of soul which is the instant and lasting reward."

"I would walk the verdant valley where the salt waves wash the feet

Of the Wasatch. Gazing upward, where the sky and mountains meet.

Filled with awe and admiration I would kneel upon the strand,

In this mountain-walled treasury of the gods—Utah."

THE IRRIGATION SITUATION.

The Federal Government must show its hand plainly in this State before the next legislature convenes in January, 1907. This refers to the irrigation situation.

If the Government fails to have dirt flying on one or more big projects in this State by that time it will be very apt to lose the opportunity of doing anything for the people of Washington in the way of reclamation work. If nothing is done within the period mentioned every corporation man in the State interested in water rights will be singing the same tune, to-wit: The Government had an opportunity and wouldn't do anything; now let it get out of the way and give the corporations a chance.

That such an argument would have great weight with the legislature it is useless to deny. More than that, the patience of the people would by that time be well-nigh exhausted and the masses, even in this valley, would be very apt to conclude that reservoirs and canals constructed by corporations would be very much better than no reservoirs and no new canals at all. Thus would the people be forced into the corporation net.

Those who made the struggle before the last legislature to secure the passage of the so-called Government bill well know what a fight it was to get it. Subterranean influence bitterly opposed giving the National Government the law demanded, and a goodly portion of this kind of influence, it might be added in passing, emanated right here at home.—*Yakima Democrat*.

THE APPLICATION OF POWER TO FARM WORK.

BY ELWOOD MEAD,

Chief of Irrigation and Drainage Investigations, Office of Experiment Stations.

(Read before annual meeting of Manufacturers of Agricultural Implements.)

Although agriculture is the oldest of human industries, its greatest improvement has been made in the last hundred years. Up to the beginning of the Nineteenth century men plowed as they did in the time of Pharaoh and threshed as they did in the days of Abraham. Progress in agriculture dates from the time when machinery began to be substituted for hand labor, from the time when it relieved the farm of the hardest tasks and gave greater rewards for the hours of toil. We can hardly realize the changes wrought by the long list of agricultural machines and implements which American ingenuity has brought forth, nor what this continent would be like if we still cut grain with a sickle and threshed it with a flail.

Machinery enables us to grow the leading farm products with one-fifth the labor required fifty years ago. In that time, the wages of farm laborers have more than doubled, yet the cost of producing crops has been lowered one-half and the quality greatly improved. Striking as are these statistics, they give no adequate conception of what agricultural machinery has done for the development of this nation, because its material benefits have been more than equalled by the social and intellectual gain which has come by relieving farmers from deadening toil. In a republic, the quality of the man is of as much importance as what he earns, and while we can not measure by percentage what machinery has done for the intellectual development of the farmer, we know that swinging a hoe does not stimulate thought like operating the lever of a steam thresher.

We need not undervalue the great achievements of the pioneer farmers to realize how much greater are the requirements of today. The courage, intelligence and skill with which our forefathers used their primitive tools, and the success they won, is a proud heritage. But their tools and their methods will not answer now. In the rapid series of changes wrought by the progress of invention the old tools have disappeared almost as completely as the Indian and buffalo. Gone also is the skill and dexterity with which the scythe, the hoe, and the ax were used. The trouble we now labor under is that the evolution of farm machinery has gone on so rapidly that it has outstripped the farm laborer's growth in mechanical skill. He has forgotten the old methods and not fully mastered the new.

The American farmer uses power machines because he can not afford hand labor. It is too scarce and costly and he is now facing certain tendencies which make his success more dependent on the economics of power than ever before. Other factors which enter into the cost of producing crops all tend to an increase. There is no more cheap fertile public land. The price of land is rising; so is the outlay for maintaining its fertility. Farm labor was never so scarce nor wages so high as now. The American farmer has to compete with the foreign farmer in prices he gets for his produce, and with the American railroad, mine and factory in

the prices he pays his help. The home competition in labor is becoming more direct and severe each year.

The building of suburban steam and trolley lines, the extension of telephones into farming districts, and free rural delivery, are bringing the city and country into a constantly closer union. Farm and city laborers meet and compare notes, and the farmer's son or the farm worker no longer hesitates to try his fortune in the factory if wages or conditions of labor seem more attractive. With the increasing wages and shortened hours of labor in the factory he is insisting more and more that farm work shall have the same privileges. In any event the influence of organized labor and the rising wages of the cities is felt today in every agricultural community. Men no longer work from sun-up to sun-down and where labor is scarce, as in California, the hours are as rigorously restricted as in any city factory. If American agriculture is to maintain itself in the markets of the world, it must do this through a continued improvement in machinery which will make the individual man more and more efficient.

It is not possible to say how this will be done with respect to any particular machine, for the work of the inventor is always an advance into the unknown, but we may with profit consider some of the general influences which should be utilized to secure improvement in design and more efficient use of machinery. The first thing is better training for the American farmer in mechanical principles. American farm machinery is not rendering the service it should, because it is not selected with wisdom and not operated and cared for with skill. We buy a plow which needs a team of 1,700-pound horses to pull it, and then hitch it behind a team of 1,200-pound horses. The result is neither plow nor team is a success. We leave our wagons, our mowers, and our self-binders exposed to rain and sun, thus lessening both their life and their service, and we do this without shame or reproach. We need in this country a public sentiment which will put the farmer who neglects or misuses machinery on the same plane with the farmer who has poor breeds of stock or who neglects to care for them. We need investigations which will enable farmers and manufacturers to adapt machinery more perfectly to the power that is to run it and the strength that is to control it. How much does the average farmer today know or think about the power required to pull any machine or the importance of having the size of machines adjusted to the size or number of horses which he keeps? And how much energy in this country is wasted by teams who walk too far for the work they do or who are worn out by being harnessed to a load too heavy for them to pull? Investigations carried on last year by the Iowa State College, to determine the relation between the weight of horses and the draft of breaking-plows, show how valuable to both the farmer and the maker of machinery a better understanding of these matters would be. When we have studied the relation of the power needed to operate machinery to the size and weight of the horses which supply this power, as we have studied the chemistry of feeding animals or the relation of fertilizers to the needs of soils, the factory will make better tools and the farmer will make more money out of their use. There has, however, been so little systematized study of the principles involved in the operation of farm machinery and so little attention given to instruction in farm mechanics in our agricultural colleges and technical schools that

manufacturers have had difficulty in securing properly trained men; that is, men who combine mechanical training with a knowledge of agricultural science and practical familiarity with farm life.

I have thus far spoken solely of the use of animal power as a substitute for hand labor. We are, however, in the beginning of another evolution whose possibilities we are unable to forecast. This is the employment of steam, wind, gas and electricity as sources of power in farm work. How far these are to take the place of both men and animals we can not predict, but every year sees their uses widening. Wind, which was at first used almost solely for pumping water for live stock, is being used to cut feed, saw wood, run the machinery of dairies, and it seems possible that with improvements in electrical storage it may in time light the farmer's house, furnish the heat to cook his dinner and iron his clothes. The potential power of the streams which rise on our mountain summits and flow down to the sea is enormous. Much of this is unutilized because heretofore the factory had to go to the stream and this was not possible, but with the improvements in electrical transmission the stream now goes to the farm and the factory. The waterfalls of the Sierras now generate electricity which pumps water for the irrigation of farms in the Santa Clara valley, 240 miles away. Steam and gas engines plow and pulverize the soil, plant the seed, pump water for the irrigation of the crop, run the cultivator, the harvester and thresher. Some are so nearly automatic that they almost displace the man as well as the horse. Gas engines used in lifting water for irrigation have run day after day an entire season with no attention except refilling the oil cup and the gasoline tank. Some farms now have more power and more complicated machinery than many extensive factories. On one ranch in California the farm machinery operated by gas or steam cost over \$60,000, and the farm equipment of this character is being constantly increased. This kind of power seems to be displacing the horse just as the locomotive has supplanted the stagecoach. The automobile can go faster and longer than the trotter. The steam plow in some places does better work than the horse and does it cheaper. This year a gasoline engine attached to a harvester on the water-logged lands of the Northwest was able to run in fields where horses mired. Throughout the southern part of the United States there is a great field for the steam and gas motor. They can operate in the summer's heat, amid the mosquitoes and flies, without discomfort and loss of efficiency which attends the use of the horse and mule.

To me the most interesting feature of the Lewis and Clarke Exposition and one which was most significant of our advanced civilization in this country was the splendid display of farm machinery in the agricultural building. No one could look at this without having pride in the men who require and use such tools. I filled page after page of my notebook with a list of these evidences of American inventive skill. It includes dairy machinery which makes better butter than can be made by hand; a 30-horsepower steam plow which will turn over the soil of a good-sized farm in a single day; a 40-horsepower traction engine which hauls its load over the country roads at five miles an hour and requires as much mechanical skill to run it as a locomotive.

The full benefits of farm machinery are not realized because the average farmer has not the mechanical training or the requisite skill to get the best results out

of these complex tools. This has been brought home to us in our studies of pumping machinery used in lifting water for irrigation. Two years ago I gathered the results of eighteen gasoline pumps installed in a valley in the Southwest. Thirteen of these had been abandoned, not because irrigation by pumping did not pay, but because the men who bought this machinery were not equal to keeping it in order. They had never before tried to run anything more complicated than a mule and the change to a gas engine was too violent.

This year our investigations have included a large number of field tests of pumping machinery in Louisiana and California. Millions of dollars have been invested in this kind of machinery. Measured by value, nearly one-tenth of the irrigated products in this country are now grown with water lifted by pumps. In the rice districts of Louisiana, one-fourth of the outlay in growing a crop is for pumping. Manifestly the efficiency of this machinery has much to do with the profits of farming. In the field tests made this year, the highest efficiency was sixteen times the lowest, or 5 per cent for the poorest pump and 82 per cent for the highest.

Last spring I called on the owner of one of the largest ranches in Southern California—a ranch where much of the water used in irrigation is pumped and where in consequence the importance of proper mechanical training has been made conspicuous. I told the owner of this ranch that our office wished to obtain the services of a man who had a knowledge of irrigation methods and who, in addition to that, was a skillful mechanical engineer; that we wished him to do two things: investigate the efficiency of the pumping machinery in a particular district; advise the farmers how to correct defects where they were observed, and show them how to use water in the right way. The reply was that if his ranch had such a man, the department could not obtain him; that such a man would be worth \$20,000 a year and that they were prepared to pay for the man who promised well a salary of \$5,000 a year. This, of course, is an extreme case, a case where large interests were involved, but a better knowledge of mechanical principles to the small farmer and to the maker of farm machinery in the country at large is relatively just as important.

The importance of mechanical knowledge to the American farmer is just beginning to be appreciated. Until within the last ten years training in farm mechanics was practically ignored by our agricultural colleges, but in recent years some of the most progressive have established courses of instruction and begun investigations. The results of this innovation have been most encouraging. These colleges have, however, labored under one serious difficulty. It takes all the time and strength of instructors to do the work of the classroom. They are not in a position to conduct investigations and collect data needed for their students, and there is at present a lack of any systematized information for use in the classroom. Realizing this fundamental need in the training of the future generation of farmers, Dr. A. C. True, director of the Office of Experiment Stations, in his report for 1904, recommended that the irrigation and drainage work of this office be extended to include investigation in the applications of power to other agricultural purposes besides irrigation. In support of this he made the following statement:

"The need of a better understanding of the principles of mechanics and of better training in the use of machinery is one of the features of American agriculture

which has not yet been adequately recognized in the courses of instruction in our agricultural colleges or in the work of this department. We are the greatest makers and users of farm machinery in the world, and it is owing to this fact more than to any other single cause that we have been able to maintain our agricultural supremacy in the markets of the world. The cost of this machinery to the farmer is one of his heaviest outlays, and the gain by increasing its life through better care or its efficiency through more skillful operation can hardly be overestimated. The difficulty of doing this is greater today than ever before. The character of this machinery every year becomes more complicated, requiring increased knowledge of engineering principles on the part of farmers. The traction engine, the steam plow, the combined harvester and thresher operated by steam power, the automobile, the growing use of electricity as a motive power on the farm, the machinery now required in dairies, in the cultivation and harvesting of rice, in the growing of sugar beets and manufacture of beet sugar, are illustrations of the momentous changes in the character of farm machines which have taken place in the last fifty years. The increase in skill and mechanical knowledge required by farmers to operate these complex and costly machines compared to what was needed to operate the primitive tools of half a century ago can not be stated in percentages. The leading European governments have recognized the revolutionary character of this feature of farm life more clearly than we have. Especially is this true of Germany and France, where both governments are continuously investigating this subject. The recent investigations of the German Government to determine the possibility of using alcohol, which can be purchased at home, to supplant gasoline, which is not produced in Germany, to operate farm engines, is an illustration of the governmental studies being made in Europe."

This extension of the work of the Agricultural Department was approved by Secretary Wilson, who supplemented Dr. True's recommendation by an extended statement, which will be found in his report for 1904. From this I have taken the following extracts:

"Closely related to the healthfulness, convenience and cheapness of farm buildings is the right selection, care and use of farm machinery. The studies of pumping machinery have shown that the most important factor in its successful use is the mechanical skill of the farmer, and we are beginning to understand that the increased complexity and cost of farm machinery make the education of the American farmer along these lines more and more desirable.

Realizing the need of improvement in these matters, and partly to meet the requests of implement manufacturers for young men having agricultural and mechanical training which will enable them to design and construct implements suited to the conditions of the American farm, a number of agricultural colleges and experiment stations have inaugurated courses of instruction and begun systematic experimentation for the purpose of bringing about a general diffusion of intelligence about this feature of farm work. They have appealed to this department for aid in this work similar to that already given them in other lines of agricultural investigation.

The requests of the colleges and stations for aid in carrying out these investigations and in planning courses of instruction have been supplemented by numerous similar requests from farmers for advice and assistance

about the selection and operation of different kinds of farm motors and other farm machinery. In the absence of any special arrangement for dealing with these problems, they have been referred to the Office of Experiment Stations and dealt with by the irrigation and drainage division of that office; but there are at present no funds which can be utilized for systematic work along these lines. I am of the opinion that results of great value, alike to the farmers and the manufacturers of agricultural machinery, will come from the extension of the department's work in agricultural engineering to include studies of this character, in cooperation with the agricultural colleges and experiment stations. I have, therefore, asked Congress for an appropriation which will enable us to employ an expert in farm buildings and farm machinery, in connection with the irrigation and drainage investigations.

The inauguration of this work on July 1st and the selection of Professor Zintheo to carry out these investigations, is, I feel confident, destined to mark a most useful and important extension of the work of our national agricultural department.

Professor Zintheo will explain some of the work he has begun and what we hope to do. This is a new field and our plans must depend on the funds provided by Congress and on the clearer understanding which further experience will give. It is on this account an appreciated privilege to submit our views and plans to this association and solicit your suggestions and criticism.

Supplementing what Professor Zintheo says, there seems to be a few general lines of work in which the Department of Agriculture can be of great practical benefit to both farmer and manufacturer. One is in the conducting of investigations and the publishing of bulletins regarding mechanical principles involved in the construction and use of farm machinery. This work will contribute to the efficiency of instruction in agricultural colleges and affect both the present and future generations of farmers. Another line of work is original investigation of the adaptation of new forms of power to farm work and their value as compared to animals. The studies of wind and alcohol outlined by Professor Zintheo are examples, of which many others might be given. The collection and publication of information by the Department regarding improvements in the design of machinery, or of new devices used in agriculture, would have great practical value. Such work ought not to be restricted to machinery made in this country, but should keep track of progress in all parts of the world. The German and French governments have done much in this direction, and its influence is shown in the improvement in design of their machines and implements, some of which are beginning to rival or surpass our own. The farm machinery museum connected with the agricultural high school of Berlin, and the laboratory maintained by France in Paris for testing the principles of farm machinery and their adaptation to the work of the different French provinces, have done much for the farmer at home and to extend trade of manufacturers abroad. The establishment of such a museum or laboratory in Washington and the gathering there of the leading types of farm machinery made by different countries, would be an educational agency worth far more than its cost.

THE RAILROADS AND IRRIGATION.

Under the heading, "The Railroads and Irrigation," the *Omaha Bee* of recent date has the following to say:

While it has been an open secret for some time that the commissary department of the irrigation propaganda that culminated in the national irrigation law of three years ago was supported by a combination of transcontinental railroads, we believe that the details of the arrangement were for the first time made public under official authority in a letter directed by James J. Hill to the irrigation congress in session at Portland last week. In this letter the great railway magnate lays claim for the railroads to the credit of inaugurating the irrigation campaign and explains that "at first three and a little later five of the great railroad systems of the west united and furnished each \$5,000 a year as a working fund to make the necessary inquiries and to spread the facts abroad."

Had it been known when the Maxwell promotion bureau was enlisting support of western commercial bodies that the agitation behind this beneficent project came simply from an aggregation of paid lobbyists, absorbing \$25,000 to \$30,000 a year as compensation and incidentals in their work, the response would hardly have been so prompt and so vigorous. That does not detract from the fact, however, that the underlying principle that the national government should assist by congressional appropriation in the reclamation of our semi-arid lands is none the less founded in wisdom and justice, nor will any one object to the railroads sharing in the returns sure to accrue from the enterprise. But while accrediting the railroad magnates with foresight and shrewdness it is a little too much for them to pose, as Mr. Hill would have it, as disinterested philanthropists when it is known that the inspiring motive on their side was not only the prospective increase in traffic coming from the settlement of the uninhabited parts of the public domain, but also the more direct and immediate creation of a market for unsalable lands still remaining in their possession out of their early land grants. With the railroads owning alternate sections it would be impossible for the government to reclaim any considerable part of the public domain without at the same time bringing the railroad holdings within the reclamation area and it is a safe guess that the railroads have already gotten back the money they spent for promotion.

In this one thing, however, namely, the occupation of the vacant tracts of the western states by self-supporting bona fide settlers, the interest of the railroads and of the general public are identical, and in the execution of pending irrigation projects and the perfection of the irrigation law to the end of safeguarding reclaimed land against misappropriation by land grabbers both can work together.

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PREPARING LAND FOR IRRIGATION AND METHODS OF APPLYING WATER.

METHODS IN USE IN NEBRASKA.

Almost the total expense of preparing land for irrigation in Nebraska is due to the construction of the field laterals and furrows. In those cases, including perhaps the majority, where the making of the furrow serves also as a cultivation the cost of making them should not be charged wholly against the preparation of the ground for irrigation.

The distance apart of the laterals in the field depends chiefly upon which of the two methods of irrigation in use in the State is to be employed. It depends also to some extent upon the character of the soil in respect to its capacity for the rapid absorption of water, and upon the lay of the land. For flooding, the laterals are placed from 100 to 300 feet apart. The greater distance obtains on wild hay land, and the lesser in the irrigation of alfalfa and small grain growing on soils which take the water readily. An average distance apart of laterals in cultivated fields which are to be irrigated by flooding is 125 to 150 feet. Feeder laterals for furrow irrigation are placed at greater intervals, ranging ordinarily from 300 to 1,200 feet, according to the lay of the ground and the carrying capacity of the furrows. There is a general tendency to build laterals closer together, as it is found that the water is more easily and effectively handled in this way.

The field laterals are very generally made about one foot wide on the bottom, one foot deep, and from four to six feet wide on top. The grade of course varies to some degree with the lay of the land, but a fall of five feet to the mile is common, and is quite generally recognized as a minimum below which it is not desirable to go.

The common stirring plow, the lister, the wooden V, and the reversible blade machine are all used for the construction of laterals and approved by experienced irrigators. The blade machine is considered better than the V in clay or rocky ground. The reversible machine requires about twice the force of men and horses to work it that the V does, but when used systematically the work can probably be done at somewhat less cost than with the V. A superintendent of large experience estimates that two men and two teams with a V can complete from one to three miles of field laterals per day, depending on the condition of the ground. For irrigation by flooding this would be sufficient for the irrigation of from twenty to sixty acres. Allowing \$6 a day for men and teams, the cost per acre would be from ten to thirty cents.

For turning the water out of the field laterals all of the better known devices are in use—canvas dams, sheet-iron dams, and dirt checks. The sheet-iron dam is said to be especially satisfactory in fields where digging as undesirable, as in fields of alfalfa or of small grain, since it can be set and removed without the use of the shovel. In flooding, the laterals are dammed and opened at intervals ordinarily coming within the range of from fifty to 100 feet.

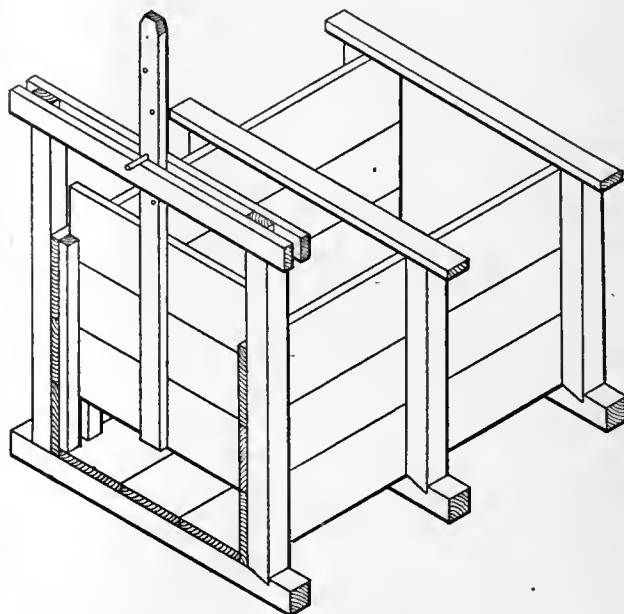
For furrow irrigation of general field crops the furrows are usually made with a plow or lister when large furrows are required. A disk cultivator makes a good furrow for watering corn and potatoes. When the earth must not be thrown against the plant, as in the case of beets or vines, a smaller appliance, known as

an irrigation shovel, is attached to the cultivator and makes a neat furrow.

IRRIGATION IN WESTERN KANSAS.

In early years a Mr. Allman supplied the garrison at Fort Wallace, Kas., with provisions. This led to an attempt to grow fruit and vegetables, for which there was a great demand. At the outset the necessity for an artificial watering of crops during the dry season was apparent. In 1877 a ditch system was constructed to supply the land, and it has been in continual use since that time. The main supply ditch takes its water from the Smoky Hill River, which flows through the northern part of the ranch.

The most commendable feature about the distributing system is the manner in which the laterals serve the land lying immediately below them and drain that above. In this the natural slope of the land favors the irrigator. An ordinary plow with a depth of cut of about ten inches and a width of about sixteen inches was used in the construction of the laterals. This was run twice



Box for Admitting Water to Ditch from Stream with slow Current.
[Illustration taken from the Primer of Irrigation.]

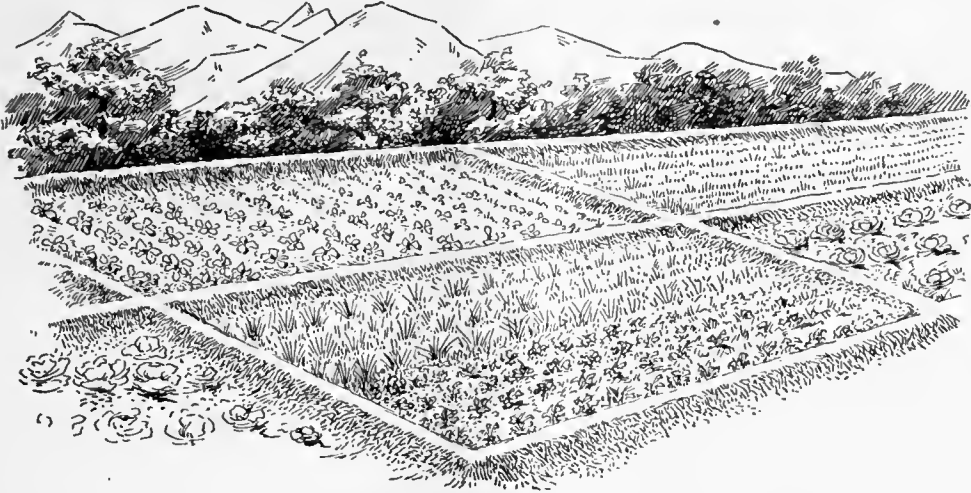
over the line of the ditch so as to make a dead furrow. Where the line of the laterals could not be easily changed to avoid a low place or hollow, the surface soil for several feet on either side of the lateral was scraped with a board scraper and a fill made. At first considerable trouble was experienced with these fills and close attention was required to prevent breaks. Breaks that occurred were found to be most easily mended by the use of straw or manure with the earth.

Crops are grown on those fields suited both to the requirements of the plant and the economical distribution of water. Barley, rye, oats, and other small grains are grown on the higher ground. They mature early in the season and need to be irrigated only at a time when water is plentiful. Some of the water used on the crops on the higher levels sinks into the ground and reaching the lower levels helps to keep them moist. Alfalfa is grown on the next lower levels, while the lowest patches are devoted to fruits and vegetables.

All grains and grasses are irrigated by flooding, while the orchard and garden are furrow irrigated. Root

crops, such as beets, carrots, and parsnips are sowed in rows eighteen inches apart. The furrows are made very shallow, but the land used has sufficient fall (ten inches in 100 feet) to be irrigated evenly throughout the length of the furrows. One break in the lateral serves to supply several furrows. Where the length is between 200 and 300 feet, the water is allowed to run down each fur-

to the rows, say within eight inches of them. In this way the water is certain to reach the small rootlets of the younger plants and a less amount of water is needed. The four-shovel cultivator is used in making these furrows. The shovels are set in pairs and one furrow is made with each pair. But one furrow is made for each row and the furrows that irrigate any two rows are made



[Depressed Beds. Illustration from Primer of Irrigation.]

row for about two hours. The quantity allowed depends largely upon the distance between the furrows. In the garden the water is run down each space between the rows except on potatoes and tomatoes. In the first irrigation of potatoes the water is turned into every furrow to insure an even setting, but in later waterings only into alternate furrows. Usually one miner's inch of water is found sufficient for garden furrows eighteen

between those rows. This makes two furrows between alternate pairs of rows. During later irrigations the furrows are made so as to irrigate two rows each, and are run in the intervening spaces where no furrows were made before.

In the orchards the furrows are made about three feet apart and are at least four feet from the trees. The cultivator used in making these furrows has five shovels.



Wind Mill and Tank for House and Garden Use. [Primer of Irrigation.]

inches apart, while as much as three or even five miner's inches are required for furrows thirty or thirty-six inches apart. Early in the season when corn is still small, furrows used to irrigate this crop are made close

One large shovel in the center makes the furrow, the two smaller ones on each side cultivate the ground. This implement is run over the ground as soon after an irrigation as possible and prepares the land for the next

irrigation while cultivating the ground. The ground is always cultivated with this implement after a rainfall between two irrigations.

In plowing fields that are to be irrigated cross plowing is better than two plowings in the same direction, as there is no danger of making dead furrows. However, ideal conditions can not be secured the first season a field is irrigated. Low places will appear where all was thought to be level and the water will wash from one furrow to another. This is especially true if the furrows are very long. When such low places are found they should be marked, so that they can be filled before the next season.

On account of the many difficulties met with, about one cubic foot of water per second is all one man can take care of the first season. Later, one man can manage double this amount.

Mr. Allman's experience has shown him that the time to irrigate different crops varies greatly, as does also the depth of water to be applied. Cabbage and like plants do well with a shallow irrigation about every ten days or two weeks. Potatoes given a shallow irrigation about setting time set well. Too deep an irrigation at this time causes the plants to make too vigorous a leaf growth and set too many potatoes. No crop should be irrigated when in full flower, though a shallow irrigation when buds are opening insures an abundance of perfect blooms. Corn does best when the land has received from five to eight inches of water just before seeding. Given a like irrigation when about ten inches high and again when beginning to tassel there is usually no need for further watering. When the season is particularly dry it is sometimes necessary to give another, but shallower irrigation after the kernels have begun to fill. Fruits irrigated a few days before they are picked are generally fresher looking than those not irrigated at this time. Mr. Allman irrigated small garden truck about every week. An inch or two of water is usually applied at each watering.

AN EXAMPLE OF HILLSIDE IRRIGATION.

On the farm of J. A. Jones, of Scott County, is a fully developed system of hillside irrigation. The water is obtained from springs. A line of drain tile intercepts the water from hillside springs. At various points along the line are openings from which the water flows down zigzag furrows between the trees and garden truck. The surplus water is connected in a pond used for fish raising and ice making.

A SERVICEABLE FLUME.

Mr. Warner, also of Scott County, has installed a system of flumes on his place through which to convey spring water to his fields. The largest flume is about twelve inches across. The bottom is made of 1.5 by 12-inch lumber and the sides of 1 by 8-inch lumber. Clear-grained lumber free from knots is chosen for this purpose. To add strength to the flume yokes of 1 by 3-inch material are placed every ten feet or so, and in such a way as to have one not more than two feet from the end of each board. Another way of arranging the yokes is to make them of 1 by 6-inch material so that they are wide enough to cover the board joints. The strongest form of brace used was one having dovetailed joints. Where these were used the tail on one of the joints on the lower member was cut deeper than the upper and wedges were driven into the joints, as shown in figure 33. In this way the joint is kept very tight.

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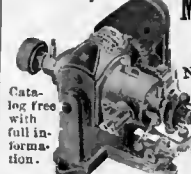
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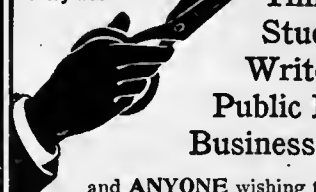
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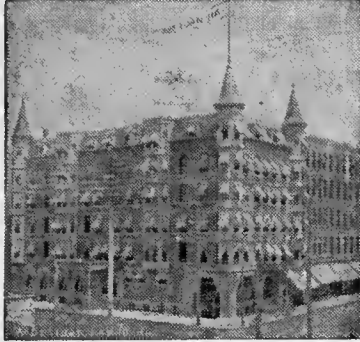
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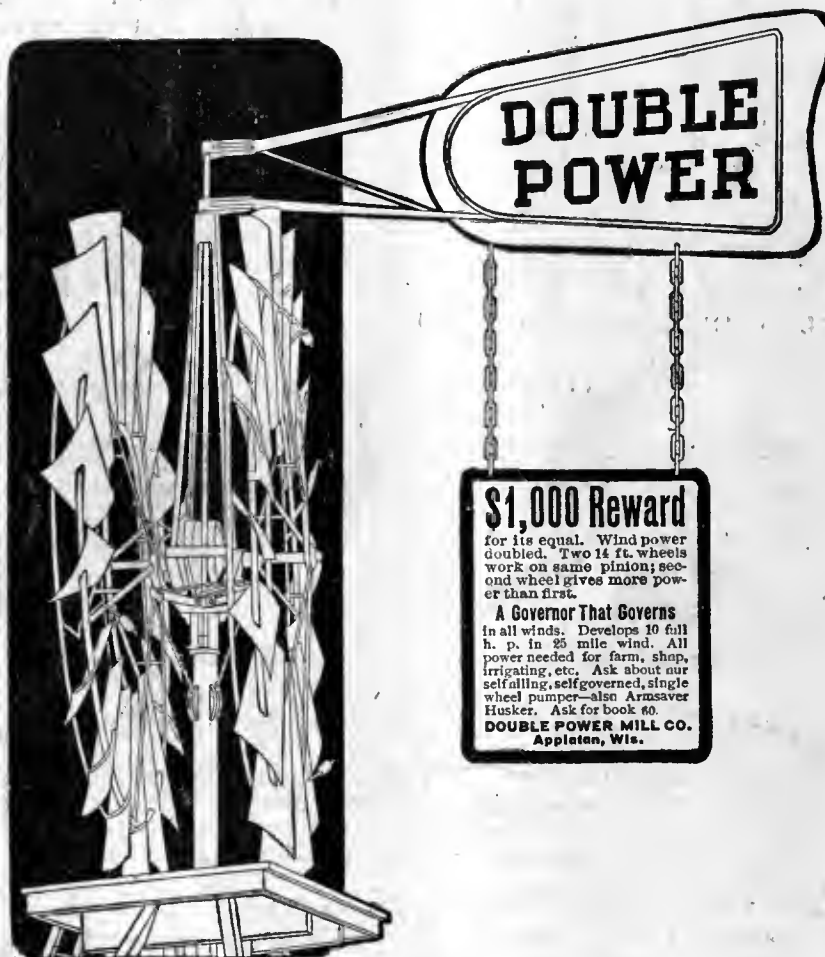
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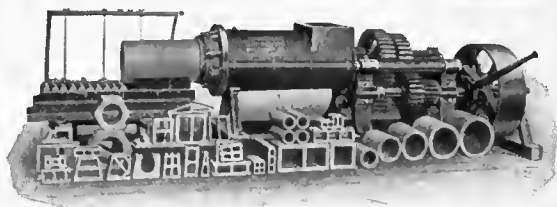
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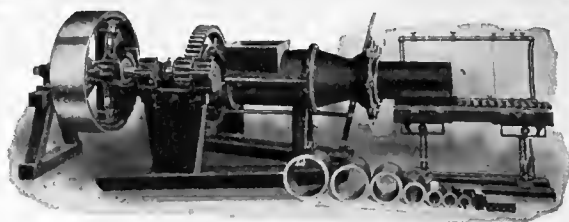
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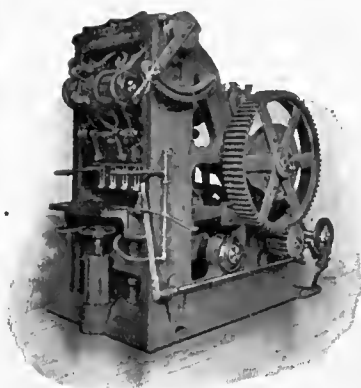




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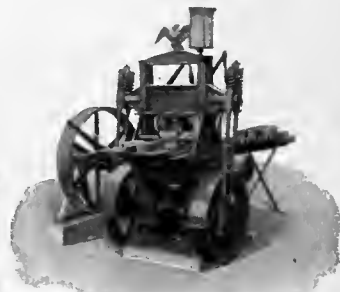
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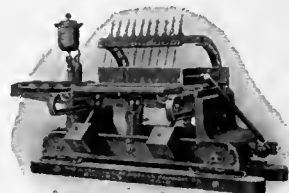
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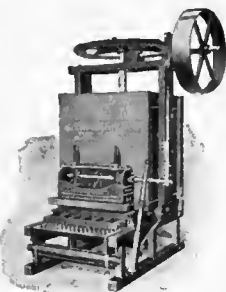
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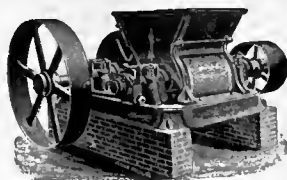
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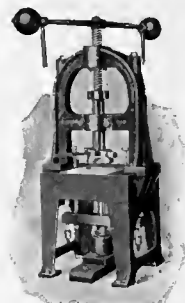
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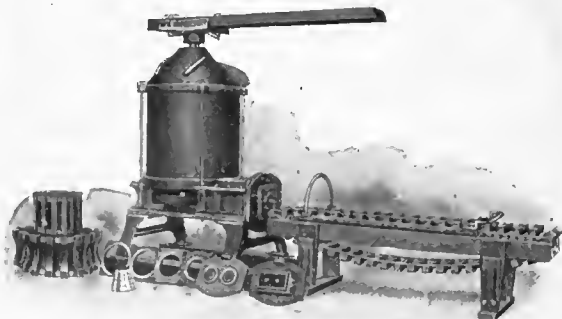
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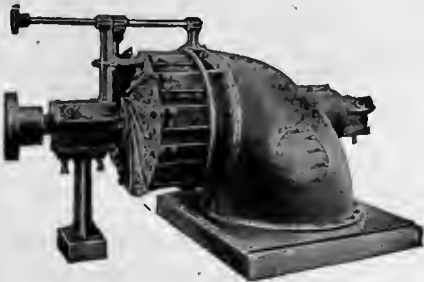


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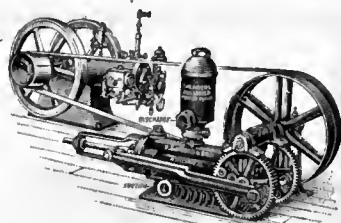


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OPERATING
WITH
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FIG. 952

HORIZONTAL BULLDOZERS, 3" to 6" CYLINDERS

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BACK GEARED
WORKING HEAD

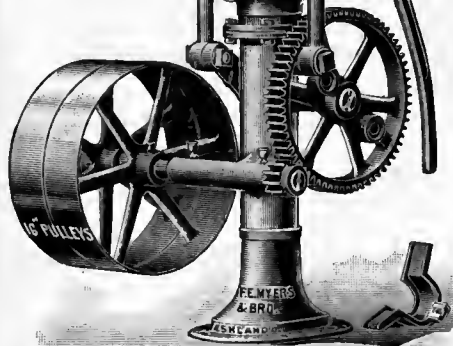
TAPPED FOR
3" PIPE

5, 7½ and 10"
STROKE

FOR
BELT, WIND OR
HAND POWER

FIG. 1113

2½" DISCHARGE



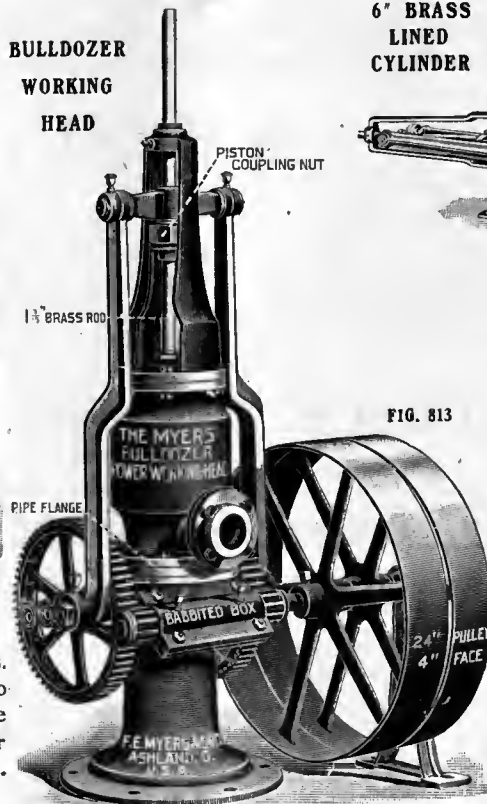
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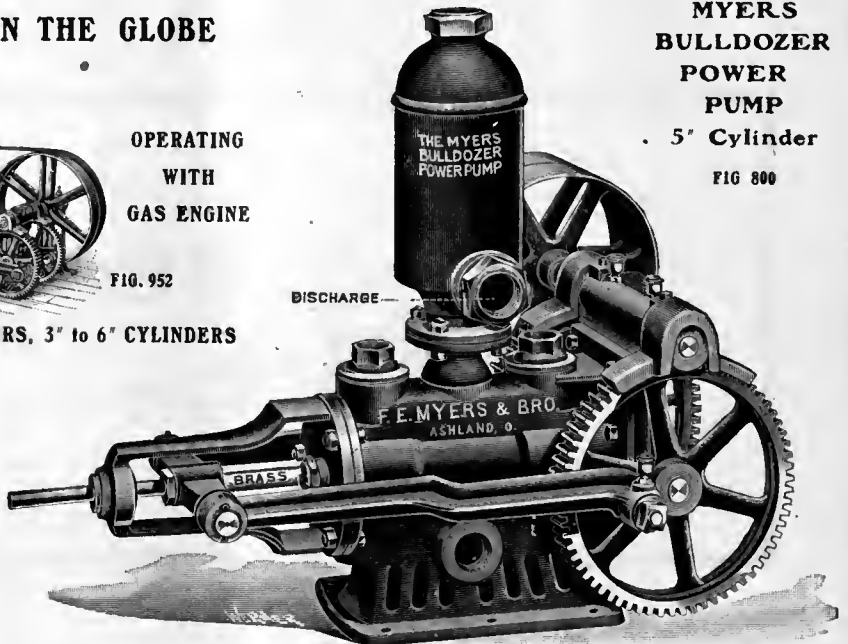


MYERS
BULLDOZER
POWER
PUMP

5" Cylinder

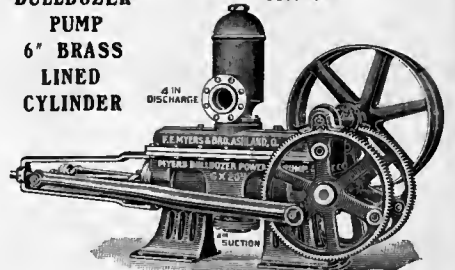
FIG. 800

DISCHARGE



BULLDOZER
PUMP
6" BRASS
LINED
CYLINDER

FIG. 1079



MYERS BULLDOZER
WORKING HEADS

No. 359

5", 7½", 10" STROKE

DISCHARGE, 2½ or 3 INCHES

SUCTION 2 to 4 INCHES

No. 364

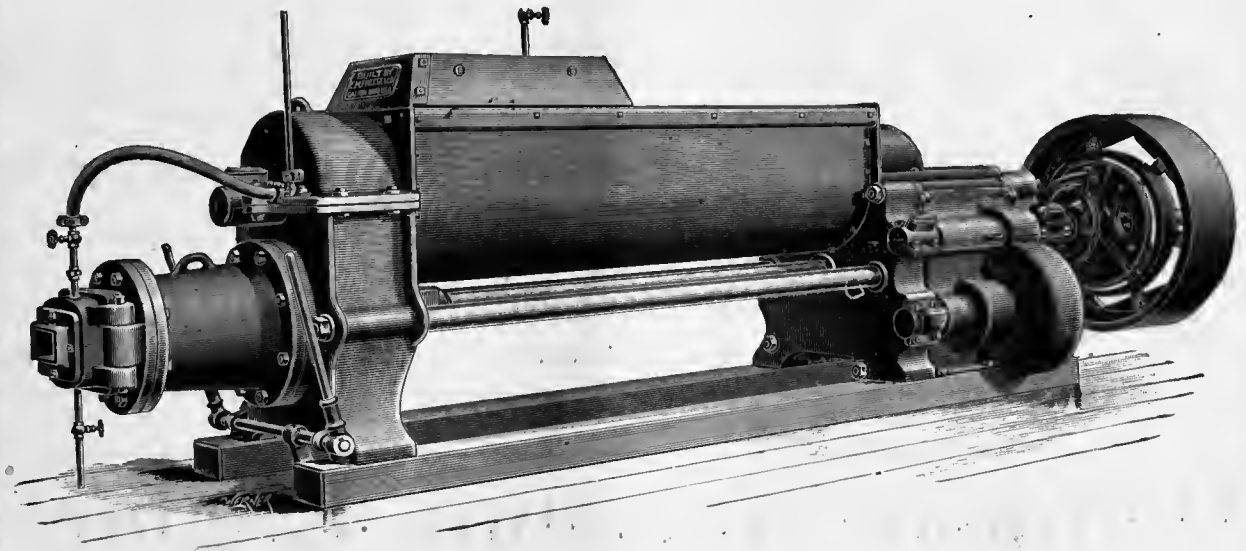
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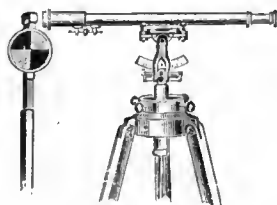
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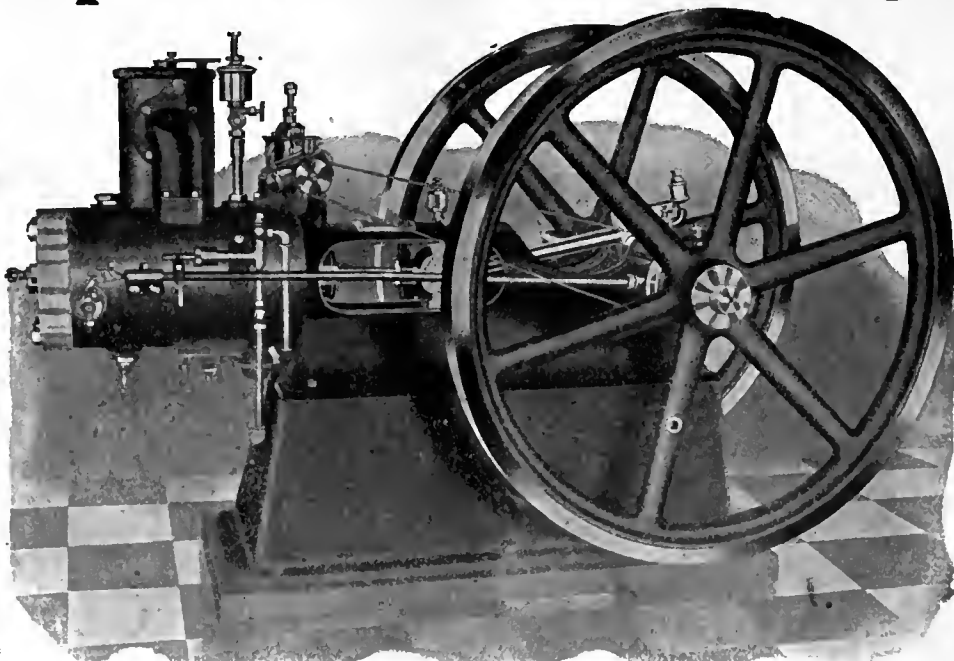
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THE IRRIGATION AGE

VOL. XXI

CHICAGO, DECEMBER, 1905.

No. 2

THE IRRIGATION AGE

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It may interest advertisers to know that *The Irrigation Age* is the only publication in the world having an actual paid in advance circulation among individual irrigators and large irrigation corporations. It is read regularly by all interested in this subject and has readers in all parts of the world. *The Irrigation Age* is 10 years old and is the pioneer publication of its class in the world.

Boost for Boise.

The citizens of Boise, Idaho, where the Fourteenth National Irrigation Congress will be held in 1906 (probably during September), are already at work on plans for entertaining the delegates. Elsewhere in this issue will be found an article outlining some of the plans. It is exceeding fortunate for Boise that she has such men as Messrs. Gwinn, Booth and Shubert, all of whom are boosters and good workers. Mr. Booth, who will act as assistant to the secretary, is president of the Boise Chamber of Commerce and a man fully qualified to handle his end of the work. Mr. Gwinn is one of the leading citizens of Idaho and his selection as executive chairman was an exceedingly fortunate one. Mr. Shubert is the best known hotel man of the State and will lend valuable assistance in arranging for the entertainment of the delegates. Everyone interested in irrigation and the development of the West should "Boost for Boise" and the Fourteenth National Irrigation Congress.

Irrigation Work Abroad.

The traveled foreigner is very apt to temper his admiration for things American by the observation that for the most part they are unfinished and crude. The wave of interest in agricultural engineering, and irrigation in particular, which has swept over this country in the last few years has naturally fostered the idea that America was outstripping the old world in the magnitude and number of her irrigation projects. A comparison of the work already completed, or under

way, in foreign countries, with the numerous plans now being worked out in the United States, seems to show that in this particular field Americans are followers or imitators and not leaders or originators.

Even in the magnitude of the work the palm must be awarded to India and Egypt, while if consummate finish and judicious water distribution are considered, the laurels go to Italy and to her engineers. In the great plains of northern India over 40,000,000 acres are irrigated, which a generous estimate shows to be over ten times the area reclaimed by irrigation in this country. Indian plains that now support a population of 800,000 inhabitants were formerly absolute deserts. The Ganges canal, which was opened over fifty years ago, now has a length, including its tributary canals, of 10,000 miles. In the State of Mysore a reservoir is now under construction which, by means of a masonry dam 142 feet high, will enclose a valley containing over 2,000 square miles. The Assuan dam in Egypt, which project it is estimated will be completed by 1908, at a cost of \$31,000,000, will form a lake more than 100 miles in length, and will make possible the growing in the Nile basin of two crops a year instead of one.

However, now that the Federal Government has undertaken the reclamation of the desert wastes of the West, it is hoped the work will no longer warrant the assertion recently made by an international authority that irrigation works in America "are often rude and of a temporary nature, the extensive use of timber striking a foreigner from the old world" and deploring the lack of well devised systems of water control.

Paying Maxwell.

In a folder issued recently by the St. Louis branch of the Maxwell-Boothe irrigation association which was repudiated by the thirteenth National Irrigation Congress, we note that the author starts out with his usual rot about "conquering a new republic and the share which St. Louis will have in it," and to one who has followed Mr. Maxwell's effusions his style is easily discernible. It is also noted that in announcing the list of speakers for a meeting which was no doubt "framed up" by the Maxwell-Boothe crowd, Mr. Maxwell modestly heads the list with his own name as follows: The Conquering of this New Republic will be the subject of addresses by Hon. George H. Maxwell, etc., etc. This entertainment was held in the Mercantile Club Hall, St. Louis, and was presided over by a local light of the name of Wernse. One of the interesting features of the announcement, however, is as follows:

"The addresses will follow a half-hour exposition of stereopticon views loaned by the U. S. Reclamation Service and Forestry Service at Washington for this evening." In order to give our readers a more clear idea of the manner in which the chief engineer of the Reclamation Service and Mr. Pinchot of the Forestry Bureau feel it necessary to assist the Maxwell-Boothe crowd and in fact pay his association for the assistance rendered these gentlemen through its press bureau, we quote herewith several paragraphs which appeared in a series of articles published three or more years ago in the columns of THE IRRIGATION AGE under the caption, "Influences In the National Irrigation Program";

"He (Maxwell) saw that it would be necessary for him to become intimate with Government officials who could bring him into contact with congressmen, members of the cabinet, and even the President. He had already become acquainted with those who had ambitions to direct the irrigation policy of the country, and through them he met heads of bureaus in Washington who hoped, through his co-operation, to broaden the sphere of their influence and work. We do not wish to bring these men into disrepute and do not say that their ambitions are either to be commended or condemned. We do say that their methods are open to criticism. That they have been working with Mr. Maxwell for the past two or three years is an established fact. The readers of 'Forestry and Irrigation' can easily inform themselves as to the bureaus which are working with Mr. Maxwell to maintain that publication. Those who were at the Irrigation Congress held in Chicago in 1900 have no doubt as to who the gentlemen are, and they fully appreciate the support which the National Irrigation Association has since received. The arrangement made with Mr. Maxwell by these officers is not known, but since 1900 the National Irrigation Association has advertised these men and their work in return for substantial support of another kind. Mr. Maxwell has, through one of these men, been able to confer with the President upon more than one occasion. Through the favors extended by another he has met congressmen who have been particularly active in

the movement for national aid, and has thus been brought into contact with the Secretary of the Interior. He has had their support in meetings of the Irrigation Congress or wherever their services have been needed. He has been introduced into clubs at Washington, and has appeared before engineering and scientific societies. Only a short time since, both Mr. Maxwell and one of his Government assistants appeared before an economic society in Washington to promote their mutual policies. Through the publications controlled by Mr. Maxwell he has been able to repay his debt to these gentlemen. Besides, he has flooded the country with material sent to the daily newspapers, advertising those who have been of service to him. He has realized that should the Government embark on a plan whereby the West is to be reclaimed, it would be to his advantage to have his friends maintained in places where they would be valuable in carrying out the policies of the National Irrigation Association. We have a bale of newspaper clippings sent out by this bureau relating to the thorough training and wide experience of the men with whom Mr. Maxwell has found it advisable to work."

It will be noted that a close alliance existed between Maxwell's association and the Reclamation and Forestry bureaus and this was an open co-operative affair until the matter was brought to the attention of higher officials in Washington, who instructed that the gentlemen at the head of these bureaus sever connections with the Maxwell crowd. These instructions were followed so far as the knowledge of the superior officers went, but those who were fully conversant with the inner facts knew that Messrs. Newell and Pinchot depended largely on Maxwell and his association to bring themselves and the work of their respective departments before the public.

This is why the heads of these bureaus feel that they should now do all in their power to bolster up the tottering frame of "The Maxwell-Boothe Incorporated Irrigation Association."

We give these facts so that those interested in the subject may keep fully posted on developments.

Our friends in various parts of the country are forwarding to us from time to time a lot of printed matter which is evidently gotten out by the St. Paul office by the National Irrigation Association, as we note that the name of Benjamin F. Beardsley, who is supposed to be secretary of this organization for the St. Paul district, appears on all of the matter. This literature is composed of reprints from Minneapolis and St. Paul daily papers and contains interviews with Mr. Blanchard, press agent of the Reclamation Service, as well as reprints of editorials from one or two other publications all of which is intended to boost the National Irrigation Association, an organization which was definitely turned down by resolution of the National Irrigation Congress recently held at Portland, Ore. This effort on the part of Mr. Maxwell and his assistants is evi-

Fulsome Harangues.

dently made to counteract the effect of said resolution and is a despairing effort to again place the association in good odor with the public. In order that our readers may fully understand some of the methods of this organization we reproduce herewith part of an editorial which appeared in a Montana daily, which is controlled editorially by one of the men who has received assistance in a political way from the association. It may not be out of place to mention here, however, that the gentleman mentioned is no longer a member of the United States Senate, and is devoting his time supervising work on his farm near Great Falls, Mont. The following clipped from the literature mentioned will give a fair idea of how Maxwell and his crowd intend to kill the usefulness of the National Irrigation Congress. It will be noted that the impression which it is intended to convey is that the National Irrigation Congress has never assisted in advancing the cause of irrigation. It will also be noted by the following clipping that the writer of the article, who is, no doubt, George H. Maxwell, states that "the Congress at its meetings has always been the arena in which much oratory has been spouted." This is a peculiar statement to come from the pen of George H. Maxwell or one of his lieutenants, in view of the fact that every one who has ever attended an irrigation congress is well aware that Maxwell has been the man of all others who forced his oratorical talents upon that body; in point of fact, if Maxwell had said less at the Congresses he would have stood much better in the estimation of the people generally. The trouble is that Maxwell has always "orated" too much at these Congresses and taken up the time of that body with his fulsome harangues until its members became thoroughly disgusted with him and he was turned down as above stated. We give herewith the quotation mentioned.

"Which facts call to mind the little furore raised by the National Irrigation Congress in Portland a few weeks since, that body going out of its way to take a poke at the Association, and disclaiming any connection therewith.

"So far as it is to be learned in Montana, the action of the Congress was unnecessary, as no one who is in earnest in the cause of irrigation could ever for a moment believe that the Congress was connected with anything which had ever particularly advanced the cause along—at least that is the general impression. The Congress in its meetings has always been the arena in which much oratory has been spouted, but with the oratory action seems to have fallen by the wayside. If the Congress has ever accomplished anything startling in the cause of irrigation it has concealed the fact from the general public. At the same time it is an excellent body, and the more such there are in the United States the greater education along irrigation lines. The only objection seemingly is that such a body should object

to any similar body doing business along the same lines."

This class of literature has been sent to all of the leading papers throughout the country and is being widely distributed in St. Louis and Kansas City, where the repudiated Association is making an effort to complete an organization whereby funds may be collected for its support. As stated on previous occasions, it is our impression that the men who are being led into this Association by such matter as is being distributed should investigate more fully. The fact that one or two publications in the country support the Maxwell-Boothe organization should not be positive proof that the money contributed will be expended for the general good of the country. If the St. Louis, Kansas City and St. Paul people who have joined this Association, or contemplate doing so, will request Messrs. Maxwell and Boothe to furnish a detailed statement of their receipts and expenditures for the last seven or eight years they will readily learn that such a statement will be difficult to obtain. It is doubtful if any members of the Association outside of Boothe and Maxwell are aware of the vast sums paid in to that Association, or the manner in which these sums were expended. The IRRIGATION AGE has been requested by friends of these gentlemen to "lay down" in its expose of its methods. It may as well be stated, however, that this journal will continue to give facts of the so-called National Irrigation Association until the public generally is fully informed of its objects and manner of conducting business.

TOWNSITE SALES POSTPONED.

The Secretary of the Interior, acting upon the suggestions of the Governor and many prominent citizens of Idaho, has announced the postponement of sales of lots in the new townsites of Heyburn and Rupert, on the Minnidoka project. The dates of sale, November 14 and 21 respectively, have been extensively advertised, and indications were that a large attendance would be present. Owing to the lateness of the season, the possibility of bad weather and the lack of accommodations for the visitors, it was deemed wise to postpone the date of sale until early in April of next year. At that time pleasant weather can be counted upon, the water will have been turned into the new Government canals, and more than 1,000 of the new settlers who have already established themselves on the lands, will be clearing off the sage brush and putting in their crops.

The Minnidoka tract today offers one of the best object lessons in the West of the wisdom of the Reclamation Law, and present conditions predicate that one of the most prosperous and populous agricultural communities in the world will soon rise up from out of the desert at this point in the Snake River Valley.

**Send \$2.50 for The Irrigation Age
1 year, and The Primer of Irrigation**

THE DESERT BLOSSOMS UNDER THE EFFECT OF IRRIGATION.

Illustrated by the Imperial Valley.

One of the most striking features in the opening of a farm by irrigation is the rapidity with which the land takes on the appearance of long occupancy once the water is applied. There is little of the long wait that attended the settlement of the timbered lands of the Mississippi valley, few of the early day privations and hardships that marked the opening of a farm in those sections. The delay comes in the constructing of the main canal, and once that is accomplished the farms are made. For the owner to plow and seed every acre in the first year of cultivation is not exceptional. By

From the beginning of time the Colorado River, a snow-fed stream rising on the west slope of the Rocky Mountains, has been rushing madly toward the sea, discharging an immense volume of water into the Gulf of California. It does not traverse broad fields and fertile valleys, but throughout its entire course has cut its tortuous way down mountain gorges, until it finally reached the gulf.

The Colorado has been an effective tool in the hand of that great artist, Nature. Through countless ages it has been carving out canyons which for scenic grandeur have no equal in the entire world. But the carving of these canyons has meant the tearing away of millions upon millions of tons of solid rock. The process of erosion is slow, and the rock has been removed in minute particles, but these particles, mingled with the sediment brought down to the river by the melting snows



General Passenger and Emigration Agents of the Northern Pacific Railway. (Taken near Sunnyside, Wash., November, 1904.)

the second or third year the tree growth has come to destroy the level stretch and bleak appearance and so obliterate the last reminder of the desert.

The story of opening one irrigated section reads much like that of another and while the following account is largely confined to the experience in the Imperial valley in California, it will serve almost as an account of similar enterprise in any of the irrigated sections of this State.

The history of arid America relates many interesting tales of the creation of vast deserts back in ancient geologic times, but none more impressive than the story of the great Colorado desert in extreme southwestern California, the desert which has become famous as the death bed of so many venturesome fortune hunters.

The Colorado desert is distinctive. Of all the deserts of the West it alone lies beneath the level of the sea; it alone was built by a river.

and mountain streams, have given the Colorado its reputation as a muddy river, for it carries more silt than any river in the United States save the Missouri.

Like all silt-bearing streams the Colorado has built a delta at its mouth, a delta more expansive and more unique than that of any other river in the world. It was this delta that eventually created the great Colorado desert.

Back in prehistoric times, instead of heading seventy miles south of the International boundary line, the Gulf of California extended more than 100 miles northward into what is now California. It was walled in on either side by high mountain ranges. The Colorado River entered the gulf from the east, at a point near the present international boundary. There it deposited its silt and solid matter, and soon began the building of a delta. The delta steadily pushed westward and southward until, after years innumerable,

it reached across the gulf, to the foot of the range on the west. In seasons of low water the delta formed an effective dam, shutting off the northern extremity of the gulf from the gulf proper, creating what became in fact a small inland sea, 100 miles in length and fifty miles across at its widest point.

Under the scorching rays of the sun the waters of the inland sea rapidly evaporated, until the sea became perfectly dry, leaving an enormous sink, at one point 287 feet below the original level of the gulf.

Each summer, with recurring high water in the Colorado, there would be an overflow into this inland sea; river water would rush in, carrying in sediment with it. As the floods receded the water in the sink again dried up, leaving behind a thick deposit of silt on the bed of the former gulf. This process of inundation continued, probably for centuries, the river each year overflowing into the sink, each year adding new soil to what it had deposited the year before. Never, however, was there sufficient overflow to restore the inland sea; only enough to cover the valley slightly, and for a short time, for with each successive dry season the flood waters were carried off by evaporation, or sank into the soil.

The overflow into the Colorado desert, as the old sea bed became known, continued for centuries, until there was a thick deposit of rich silt covering practically the entire sink, the Imperial valley, as it is known today. But as the deposits were made in the Imperial valley they were also made close to the river channel, and today, except in seasons of extreme high water, there is no longer an overflow into the Imperial valley; the river is unable to climb its banks.

When the inland sea first evaporated, a thick coating of salt was left on its bed. The annual inrush of water from the Colorado gradually carried this salt to the lowest spot in the valley, creating what is known as the Salton sink. Most of the salt had been concentrated in this low area, forming a vast salt bed five miles wide and twenty miles long, located near the north extremity of the valley, and seventy miles from the Colorado River. Today this salt is being scraped up by the carload, shipped to a refinery and constitutes an important source of supply for the home market. So thorough was this washing that most of the salt left by the evaporating sea has been concentrated in the sink, leaving little saline matter beneath the rich deposits of silt that line the rest of the valley.

Today the Colorado River, that created the Colorado desert, or the Imperial valley, is being utilized in its reclamation. The waters which once freely flowed from the Colorado at certain seasons over into the Imperial country, now have to be diverted onto that vast tract. Fortunately, however, in times of frequent overflow, the waters of the Colorado cut three channels down into the Imperial valley, running toward the Salton sink, and these old channels have recently been connected with the river by artificial canals, and have once more been brought into use as conveyors of water. Five hundred thousand acres of land in the Imperial valley in California, and half as much adjoining land across the international boundary, have been laid off, and are being furnished with water from the Colorado River. Most of this land is below sea level. The reclamation of the entire area has been undertaken by private capital, and is being pushed to a successful conclusion.

Five years ago the Imperial valley was a vast desert waste, without water, without settlement, without development of any kind. Today it gives indications of what is to come. Fully half of the valley has passed into private ownership, and is under irrigation, or is being brought under irrigation, and the remaining lands are being taken up at a rate which insures the ultimate development of the entire valley, but it may be many years before the Imperial country is fully developed.

The Southern Pacific Railroad has built a branch line clear through the valley from a point on its main line to the international boundary, and has already installed one cross-line. On this road five flourishing towns have sprung into existence, Brawley, Imperial, Heber, Calexico and Holtville. Calexico is on the border line; directly across the line in Mexico is another city, really a continuation of Calexico, which goes by the name of Mexicali. Each has its customs house, and the two combined, when the Southern Pacific further extends its line into Mexico, will form an important shipping point.

Imperial is the principal town in Imperial valley, and is located in the very center of the irrigated country. It started in 1900 and has developed with the country. It is more than a typical frontier town, it has more the appearance of a permanent settlement; its buildings are carefully constructed; its streets regularly laid out; it has its newspaper, a national bank, with more than \$200,000 deposits, and is well equipped with stores, which supply almost every need of the residents and those in the tributary country; has a telephone system, electric lights, water system, public schools and churches.

From the veranda of the hotel you can look off to the east, across the once dreaded Colorado desert, and see in the distance a long, low line of what might be a bench of solid salt. It is the white sand that once formed the eastern shore of the gulf of California. If you approach the sand you will find the shape of the ancient beach has been preserved; it takes but a slight stretch of the imagination to see the gulf restored to its old in a day, and there is no water save what you carry with you.

The lands of Imperial valley having been subject to entry under the public land laws, many of the first settlers have made desert entries, taking the domain, covering over a country that is now being studded with great farms. The line of this beach can be traced for miles, but no one follows it up; it's too hot on those white sands to travel far; maximum area, 320 acres. In most instances they have made a mistake. They have taken more than they can irrigate properly; more than they need to make a handsome profit on their annual crops.

But the men who have gone in and taken forty, or even eighty, acre farms, and have intelligently applied themselves to only so much land as they can handle, are meeting with the utmost success. This is a problem that will work itself out in time. The men who made a mistake at the outset now see their error and in another season will get better results; but this is the history of every irrigation district where opportunity is given to acquire lands in large quantities.

If a man is going in largely for dairying of stock raising and portions of the Imperial valley are ideal for this business, he is justified in taking up 320 acres. If, on the other hand, he intends to plant his lands in can-

taloupes, in orchards, in table vegetables, he does not need 320 acres. If he can manage it, if he has the money to run it, let him take the largest tract obtainable; but for the poor man to take up 320 acres of this land is folly.

It should have been said before that one of the chief attractions of Imperial valley is its early season. Fruit and vegetables grown here ripen several weeks in advance of the crops elsewhere in California. The Imperial farmer can supply the earliest market, can command the highest prices, and by the time other sections are getting their crops in the market the Imperial crop will have been consumed, and the farmer will be putting in his second planting. In this country a crop of wheat or barley can be sown in November and harvested in May; a second crop of Kaffir corn, Milo maize, millet or sorghum can then be planted and mature that same season. Wheat and barley, by the way, stand prominent in the list of crops that give quick return. Experience has demonstrated that forty-five bushels of wheat or fifty-five bushels of barley can be depended upon if the farmer knows how to intelligently apply the water and put in his crop. Alfalfa is another good quick crop. If seeded in the spring four crops can be cut the first season, and after that from six to eight crops each year. This record can not be equalled anywhere else in the country. Sugar beets are coming into the Imperial valley and negotiations are already under way for the erection of a sugar factory at Imperial. In fact, almost any crops can be grown, except apples and those fruits which will not stand frost.

APPROVE SUNNYSIDE SCHEME.

A recent telegram from Washington says:

The superintendent of the geological survey and the chief engineer of the reclamation service have approved the Sunnyside irrigation project, and the matter has been laid before the Secretary of the Interior for his final action.

The project contemplates the irrigation of 40,000 acres of land at an estimated cost of \$40 an acre, and this with the Tieton project, which is also before Secretary Hitchcock for his approval, will bring about the reclamation of not less than 64,000 acres in the Yakima valley. The estimated cost of the Tieton project is \$50 an acre.

The Sunnyside scheme, which will probably be approved by the secretary, involves the purchase of the entire property and rights of the Washington Irrigation Company, exclusive of lands which the company owns. These lands, under the terms of the contract, are to be watered at a specified annual price per acre.

The amount of the purchase prices is withheld, pending Secretary Hitchcock's action, but it is reported to be in the neighborhood of \$250,000.

The recommendation of the Sunnyside project, following closely upon the announcement of definite action in regard to the Tieton scheme, will, in turn, probably be followed by a definite announcement in regard to other units in the great Yakima scheme within the next few months.

**Send \$2.50 for The Irrigation Age
1 year, and The Primer of Irrigation**

THE SAHARA DITCH, WYOMING.

A Wyoming enterprise of considerable importance, now nearing completion, is that of the Sahara Ditch Company.

The canal bearing that name will draw its water supply from Powder River and will irrigate and reclaim about 10,000 acres near Sussex, Wyo. Most of this land lies in a body and is included within the great bend of the river, near this point, where the stream gradually changes its course from a southeasterly direction to due north:

The soil is good and experts have pronounced the tract an ideal one for irrigation, and situated as it is just away from the southeast base of the Big Horn mountains, the winters are milder and the springs earlier than in other parts of Johnson County or the State in general.

Johnson County, which formerly included all the country surrounding the Big Horn mountains, was long



View Showing Construction of Flume over Powder River.—Property of the Sahara Ditch Company, Buffalo, Wyo.

ago christened by an eminent judge as the "Garden of Wyoming," and the only reason for the tardy development of this tract on Powder River, was the greater outlay necessary for its reclamation. Lack of capital at home and lack of knowledge in regard to it abroad.

The present incorporators of the company are all local business men or engaged in the stock industry, and are men who have made their own way unaided except as Nature generally aids the industrious and thoughtful. With its great natural resources of coal and oil well explored, but yet undeveloped, the promoters believe the Powder River valley has a great future, but at the present time the reclamation of these lands is of special interest and importance, as a source of winter forage for those who desire to avail themselves of the extensive range privileges of the surrounding country, a range extending to the Platte River on the south and to the Black Hills on the east.

Most of the land under the Sahara ditch has been

segregated under the terms of the Carey Act and will be thrown open to settlement as soon as construction work is completed and the formalities of law complied with. Probably in the early spring of 1906.

E. D. Metcalf is president and W. J. Thom, secretary of the company, both of Buffalo, Wyo.

FROM COWBOY TO CAPITALIST.

Mr. I. D. O'Donnell, to whom the Bismarck irrigation crowd owe much of the knowledge acquired during their visit to Billings, came to the Yellowstone valley twenty-three years ago, beginning life there as a cow-boy. He is the pioneer in the new system of irrigation, and owes much of his success to the water which his efforts were largely instrumental in turning upon the land he had gradually acquired. Water applied scientifically to the soil has made him a rich man and it is not to be wondered at that he is an enthusiastic irrigationist. Mr. O'Donnell delivered an address at the State irrigation congress in Bismarck last winter,



Inside View of Flume over Powder River near Sussux, Wyo.

and is acquainted with the conditions that exist in the Bismarck irrigation belt. In conversation with the writer Mr. O'Donnell said: "There are no grounds whatever for the theory advanced by some of your people that the soil in the vicinity of Bismarck will not hold water. The top soil of your North Dakota lands is as good or better than that of the bench lands of Montana, and a good, porous subsoil is all the better for irrigation purposes, as it will do away with the danger of the soil becoming waterlogged.

"If the soil is properly worked on the surface there will be no trouble about getting water over it. Your ditches will hold water without a question, as the silt from the river will soon form a coating on canals and laterals and make them water-tight. Our new canal is carrying water through four miles of loose, open gravel, made water-tight by the natural process, and the Missouri River is much more certain to form a water-tight coating than is the Yellowstone. The silt from the river is also a great fertilizer. The fact that thousands of people are passing through the cheap lands of North Dakota every year and settling on the irrigated lands of Montana should be all the argument necessary to convince your people that irrigation is just what is needed."

—*The Palladium*, Bismarck, N. D.

THE CROW INDIAN RESERVATION.

BY A. BUCHANAN, BILLINGS, MONT.

The engineers for the northwest division of the United States Reclamation Service have opened their offices at Billings and are now in the field engaged in making the preliminary surveys of the seven great irrigating projects that will be directed from this point. For the next year or so over one hundred and fifty men will be engaged in the field in laying out the immense projects that are being undertaken by the national government and millions of dollars will be spent by Uncle Sam in reclaiming land that under the present condition is valuable only for grazing purposes. Three of these great canals will be dug on the Crow Indian reservation and the contract for the first of these which is destined to make the Big Horn valley one of the most fertile farming regions in the Northwest will be let soon. The government land office for this district is receiving hundreds of inquiries from Minnesota, Iowa, Missouri, and in lesser degree from other Mississippi valley States in regard to the opening of this great reservation and asking for information of every sort in regard to the requirements of settlers, the condition of the country, climate, etc. But Uncle Sam pays little heed to these letters; he is too busy with his irrigating enterprises to advertise the land, and those who want to learn more about the reservation must depend upon the newspapers for information. The land is here and will go to those who are first on the ground.

A word as to the State in which this magnificent domain is located. Montana is sometimes called the Mountain State, but the mountains are confined to the western portion. Montana has an area of 145,000 square miles, or a little less than the empire of Japan, and under a complete development of irrigation and intensified, diversified farming will support a population fully as large. Considering the natural resources and size of the State, it has the smallest population and consequently offers the greatest opportunities for the home-seeker and investor of any State in the Union. In all this vast area, no more favored locality is found than that of the Yellowstone valley that meanders across the southern and eastern portion of the State. Protected on all sides by mountain ranges and enjoying the benefits of the warm winds from the Japan current, its winters are remarkably short and mild for this latitude. The snowfall is less than that of the southern parts of New York or Ohio. Plowing is not an uncommon sight in December, and building operations often continue through the winter, with only temporary interruptions. The ceded strip of the Crow reservation takes in a wide belt of this beautiful valley and it is here that the largest of the canals is to be built.

The Custer battlefield lies in about the center of the Crow reservation and on the south line of the ceded strip. It was here that Sitting Bull and his savage Sioux exterminated Custer's division twenty-nine years ago. The agency is near by and in the pretty valleys surrounding it many of the old warriors who helped the Sioux and Cheyennes in their bloody work are following the peaceful pursuit of farming. Today the larger portion of the Crows are earning their livelihood by honest toil, although they still work under the direction of farming experts employed by the government. The

ceded strip comprises in round numbers 1,150,000 acres, or about one-fifth of the entire reservation. It lies within Yellowstone County and its western border is only a few miles from Billings, the county seat. The Burlington railway traverses it diagonally and offers an outlet to the eastern and western markets. The land is a rolling prairie, with plenty of wooded sections and numerous streams that insure water for irrigating purposes. The largest of these, the Big Horn, gets its water supply from the snow-capped mountains of Wyoming. The soil is mostly a sandy loam and in some sections a black alluvial deposit. No better soil for general farming and horticulture exists in the world. Wheat, oats,

times as much under other methods, the raising of alfalfa offers the greatest inducements. Under ordinary conditions, three crops can be raised each year, stock can be turned in on the stubble after the third cutting, and there is a ready market for the product among the sheep men who buy it in the stack and winter their stock on the ground. In the Yellowstone valley today there is a larger acreage in alfalfa than all other crops combined, and as the price runs from \$3.50 to \$5.00 a ton in the stack, and six tons is an average yield, and the cost of cultivation is less than in any other crop, the profits from this source are considerable.

Although Uncle Sam is going into the irrigation business on a bigger scale than anyone else, it remained for private enterprise to point out the way and the private individual or corporation still has the right to take out water when he fulfills the legal requirements. Private enterprise has already accomplished a great deal for the reclamation of the Northwest, and that, too, in the face of untold obstacles. The lower portion of this valley, which is far prettier to the eye of the farmer than its name would imply, is within the ceded strip, and it is here that the government will construct its first ditch, reclaiming thirty-five thousand acres that is now covered with sage brush. There are only a few thousand acres of this great valley that is under cultivation just now, but the crops on these have been enormous and experiments have shown that it is adapted to general farming and is particularly favored for fruit growing. Along the Yellowstone River for 350 miles are dozens of ditches of lesser size, and land is still comparatively cheap. Nothing has been done to advertise the country. Eastern Montana and northern Wyoming are today the last of the old frontier. For years past thousands of settlers bound for the coast have passed through valleys more fertile than those at their journey's end. These valleys needed but the magic touch of water to make them blossom as the rose. Within the last few years, private capital has accomplished a great deal, and now Uncle Sam, with his limitless wealth,



Threshing at Miller's Ranch, Three Miles South of Billings, Mont.

barley and rye can, by reason of the large average yields per acre, be produced at a less cost than in the rain belts of the middle States. Wheat on sod land, without fertilizers of any kind, produces from twenty-five to fifty bushels to the acre. Oats yield from forty to one hundred standard bushels; barley, forty to sixty bushels; rye, twenty to twenty-five bushels an acre. In potatoes the Yellowstone valley can rival the largest yield that Colorado can produce under the most favorable conditions. Any place in the valley will produce two hundred bushels and several have made records above five hundred bushels. There is a ready market right in Montana for potatoes at from 65 cents to a dollar a hundred.

The impending opening of the Crow reservation and the rapid development of the Yellowstone and other valleys in the eastern part of the State has attracted the attention of capitalists and by the time the ceded strip is thrown open there will be other avenues for marketing the product of this rich agricultural region.

Many homeseekers are taking time by the forelock and getting on the ground early in order to "avoid the rush" and to have the advantage of an actual acquaintance with local conditions before the "strip" is opened. Some are purchasing Yellowstone valley lands outside the strip that are already under ditch, as lands are still cheap and the difference in cost is not enough of an object for those who command ready capital to make it worth while to wait for the opening.

To the farmer who is accustomed to cultivating an "eighty" or a "quarter," and has had little experience in what is known in the Northwest as intensified farming, where a few acres is made to do the work of ten



Ranch of Louis La Fehldt, Five Miles North of Billings, Mont.

will complete the work. The opening of the Crow reservation will open the eyes of the East to the fact that right here at their very doors lies a region of undeveloped resources that will in the course of time become the stronghold of the nation. The towns that a few years ago were frontier trading posts are beginning to live up

to the possibilities of the section. In Billings, the trading center of a section half as big as Missouri, new hotels have sprung up, new stores with eastern ideas are winning trade, new industrial enterprises that a few years ago would have been laughed down as the vagaries of a scheming promoter, are gaining ready support. Everywhere is the spirit of progress and the homeseeker will come from the quiet East into a country bristling with enterprise and eager to get ahead. While the ceded strip is only a small part of the great reservation, the influx of settlers is bound to have an effect on legislation and the rest of the land will not long be withheld from settlement.

MORE ABOUT MONTANA.

In response to a letter of inquiry the following letter was received recently from a well known rancher. This is a fair illustration of what is being accomplished under irrigation near Billings.

BILLINGS, Mont., Nov. 1st.

DEAR SIR:

In the fall of 1904 I purchased forty acres of the Billings Land & Irrigation Company, paying \$35 per acre therefor.

At the time that I purchased the land it was covered with buffalo grass and cactus and had never been broken. In March and April of the present year I fenced the tract with 47-inch "American Field Fence," posts one rod apart. I hired the work done, and the fence and labor cost me about \$100. I had the ground plowed and harrowed a number of times, drilled to oats and the ditches for the irrigation of the tract, constructed from the lateral of the company; this cost \$200. In addition the seed cost me \$55. The expense of harvesting and threshing amounted to \$100.

doubtedly have increased my crop by 50 or 75 per cent.

Next year the ground should do much better, on account of the newness being worked out.

Yours truly,



Alfalfa Cutting on Hesper Ranch, owned by I. D. O'Donnell, Billings, Mont.

I. D. O'DONNELL.

Among the many interesting men to be found in Billings, Mont., is I. D. O'Donnell, who is credited with originating the five and ten-acre plan for irrigation farming near that city. In a recent conversation with this gentleman he stated that the small tract for the man with small means has been his idea and after many years' effort in this direction has proved successful. Mr. O'Donnell states that many of the successful small tract farmers near Billings are men who work in town and look after their landholdings at odd times and in many instances they make as much clear money from their farming operations as they make at good wages in town, thereby doubling the income. Many of these small farmers are engaged in dairying and raising celery, both of which bring good returns. In another column will be found further mention of Mr. O'Donnell.

WILL BUILD A NEW TOWN.

Word comes from Belle Fourche that the contract for constructing the big dam, one of the factors in the government irrigation project under way, was let to a Denver contracting firm. This will be a cement wall 6,500 feet across and eighty feet deep, and will take four years' time to complete it. A new town will be started about twelve miles below Belle Fourche on Owl creek, where a large sugar beet factory will be established, and the government will operate a large experimental farm to be conducted under the supervision of the agricultural department.—*Mining Review*.



View on Crow Indian Reservation, Montana; Showing Some of Land Ceded.

From the tract I harvested a little more than 40,000 pounds of oats, part of which I sold at the machine at \$1.20 per hundred, the purchaser furnishing the sacks. The balance I have stored and expect to receive \$1.50 for them next spring. In addition I have the pasture and straw. As stated, I hired all the work done. If I had been able to attend to it myself, and thus get the water on the crop when it was needed, I would un-

Send \$2.50 for The Irrigation Age
1 year, and the Primer of Irrigation

EMMETT McCORMICK'S RANCH NEAR BILLINGS.

Among the many men who have settled in Montana near Billings and who have been successful in that country is Mr. Emmett McCormick, who has a well improved 160-acre ranch six miles west of Billings. Mr. McCormick, with whom the writer talked not long ago, reached Billings twenty-two years ago and secured employment as foreman for the Custer Cattle Company. He has been on the ranch for the past five years, working it two years of that time on shares. He has harvested



Home of Emmett McCormick, West of Billings, Mont.

three crops, amounting to a gross figure of \$22 per acre, or over \$3,500 for one year's crop. Mr. McCormick also works another quarter section on shares, from which he makes about \$1,100 net each year. As the actual expenses of running the two ranches does not exceed \$1,000 a year, it will be readily seen that the income from his home ranch is clear profit. This sum, over \$3,500, should satisfy a man of ordinary ambition. Mr. McCormick's home ranch is all seeded to alfalfa with the exception of what is used for corral and garden purposes. A photo of Mr. McCormick's ranch house is shown herewith.

NORTH DAKOTA IRRIGATION.

A reconnaissance of much importance in North Dakota has been completed recently by A. L. Fellows, State engineer, formerly of the reclamation service. Mr. Fellows has found a large number of small tracts which may be irrigated, and in dry seasons greatly benefited thereby.

He points out what is now being generally recognized, that irrigation, to be successful on these lands, must be brought about by the construction of very cheap and economical works, simple in design, such as can stand idle possibly through several wet years, and still be available in years of drouth. These small tracts of lands are widely scattered and in the hands of private owners, many of whom do not care to farm the lands themselves, but are holding them as grazing lands or with a view to future speculation.

These owners do not wish to incur any considerable expense in irrigation, and while they are willing to have the government undertake the work of reclamation, are not inclined to assume any responsibility in the matter. In other words, if the government will step in and make the land valuable they will not object, but they do not care to obligate themselves to pay the expense which

might be incurred. Discussing this question today a prominent official of the reclamation service asked:

"While irrigation is talked and urged by newspaper writers and real estate dealers in towns, it is very apparent that actual farmers and small land owners are not even yet particularly impressed with its importance. They do realize, however, that it involves the introduction of new crops and methods of cultivation with the hard and continuous labor that is inseparable from successful intensive cultivation.

"The greatest difficulty to be overcome in the North Dakota situation is not so much the building of irrigation works as the education of the people who now own land, and who are apparently satisfied with present conditions and evince little interest in schemes of enthusiasts and government experts."

The semi-arid section of the State, during the past five years, has had more than an average rainfall in the growing season, and bountiful crops have rewarded the farmers. Agriculture has been extended far across the line which heretofore has been regarded as separating humid from semi-arid sections. Under the circumstances, the agitation for national irrigation has encountered more or less indifference on the part of the land owners.

SENATOR HANSBROUGH WILL NOT TRY FOR AMENDMENT.

Senator Hansbrough, of North Dakota, who was in St. Paul recently, denied to a local paper the report from Washington that he is going to try for an amendment to the irrigation law this winter, which will take the work out of the hands of the interior department. He says the present organization of the work, with a competent engineer to supervise the bureau, is satisfactory, and he has no intention of trying to change it.

In an interview Senator Hansbrough stated the situation to *The Journal* as follows:

"The facts are about these: When the irrigation law was passed in 1902, the work was placed under the interior department. What has since been known as the reclamation bureau was organized out of the employees of the geological survey. There was a general feeling in Congress that the government, having entered upon the reclamation of arid lands, the very best engineering talent of the country should have charge of the work. There was some doubt, whether well founded or not, about the capacity of the geographers and hydrographers of the survey bureau, and their fitness for this important service.

"As chairman of the committee on public lands, I had had charge of the irrigation law. By reason of this fact I felt a very deep interest in its success. I had no doubt in my mind of the importance of securing the best engineering ability; so I introduced the bill creating the office of supervising engineer of the reclamation service. This was done after consultation with President Roosevelt.

"Some of the members of the reclamation service objected to my bill, and devoted themselves very strenuously during the entire session to preventing consideration of it. The irrigation committee was quite evenly divided on the measure, and the session adjourned without any action.

PRESIDENT TOOK ACTION.

"The necessity for an experienced engineer of high attainments appears to have been deeply impressed on the President's mind, and about a year ago, being advised by the attorney general that he had full authority under the irrigation law to do so, he appointed Mr. Grunsky, who had been on the Panama canal commission, and who was an engineer of pronounced ability, to the position which I had sought to create in my bill. Very naturally the reclamation service was greatly displeased with the action of the President, and through what may be termed the literary department of the service, this displeasure was extensively paraded in the newspapers, the President being severely criticised for his action. It was charged, to begin with, that when I introduced my bill to create the office of supervising engineer my purpose was to take the reclamation work out of the hands of men who were appointed under the civil service law, and to place it in the hands of some man who would build up a political machine. This charge was enlarged upon from time to time, until numerous senators and representatives were brought into the alleged conspiracy.

"Very naturally, the literary bureau of the reclamation service was greatly embarrassed when President Roosevelt, himself, a famous stickler for civil service methods, came to regard the situation as I did, and Mr. Grunsky was frowned upon as an interloper. Nothing has since transpired to confirm the dire apprehension of the reclamation service. I am sure that in the appointment of Mr. Grunsky the President had no thought of building up a political machine. Nor do I believe that Mr. Grunsky himself had any idea of that kind. I am glad to know that the reclamation service has concluded to work in harmony with Mr. Grunsky, and feel confident that they will work together without friction."

DEMAND FOR WESTERN LAND.

That there is greater demand for western lands, and especially for Colorado lands, is proven by the remarks of residents of eastern cities who deal in farms and ranches. They say that the people of this State have no conception of the extent of the inquiry. Gradually their inquirers are coming west to investigate for themselves, and the number of purchases resulting make up an unusually large percentage. The reasons for this are well set forth in the following, taken from the *Denver Republican*:

A great tidal wave of investment is reaching out from the East. Its approach is as yet scarcely recognized at home, but the land agents, who are no more optimistic than their good business warrants, realize this. It is stated in some quarters that home people are missing promising investments, which eastern people are quick to seize upon. The arid and semi-arid lands of Colorado have already advanced in price and will undoubtedly do so again if the demand for them continues.

C. E. Wantland, general sales agent of the Union Pacific Railroad, has just returned from a trip of several months, which took him all over the Pacific coast region and intermediate territories. He also attended the irrigation congress at Portland. His statement of conditions as he found them will be a revelation to many people living in the West itself. It should add much to a better understanding of the situation.

"The general land conditions in the West," said Mr. Wantland, "are better now than at any time in the last five years. There are many reasons for the present land movement in Colorado, Kansas, Nebraska, Wyoming, and certain districts on the Pacific coast.

"The national irrigation work being done by the government has given strength to all irrigation enterprises, and a great deal of eastern capital is now going into irrigation work. Questions affecting colonization work are being discussed now intelligently. Business men of the West are beginning to see that colonization is just as important as canal building, and the quality of settlers is an important item in the work.

"The government has now let contracts on irrigation works for over \$25,000,000. The actual work now going on, or which will be undertaken in the near future, is of great benefit to the merchants of the western states, and is, of course, of interest to every property owner in the country. It is being realized now that when the census of 1910 is taken the western half of the United States will not show such a small percentage of population as at present, and the number of farmers in this country will be greatly increased.

"Of course, general prosperity is a great factor affecting the land movement now on in the West, but probably the greatest factor is the great gain from scientific agriculture. While 10,000,000 acres may be added in the next ten years to the agricultural area in sixteen semi-arid States, owing to national and private irrigation, thus doubling the land now reported as under irrigation by the last census, probably from 20,000,000 to 50,000,000 acres now considered arid or semi-arid and good only for grazing purposes, will be reclaimed and made into productive farms, by reason of improved methods.

"Even the very worst deserts are receiving attention. The Campbell soil culture system and the work of the United States Department of Agriculture and State agricultural colleges, are producing wonderful results. The land agents of the country are just beginning to wake up to the advantages, and it is safe to say that the business men of the western States have not yet had their eyes opened to the gain which will come to the trade of these States from the new farms springing into existence now in the semi-arid districts.

"The combination of circumstances now giving strength to western lands is something unusual and there seems every reason to believe that the movement now under way will extend quickly to all parts of the Pacific coast where the conditions are at all favorable. Money is easy and men are beginning to realize that land is the safest form of investment. The opening of foreign trade across the Pacific is giving a new market for products raised in the intermountain and Pacific coast States. The new demand for live stock is such that buyers from Chicago now meet buyers from the Pacific coast as far east as central Wyoming. New packing centers are being developed and shortly the rapid increase in population of the western States will force the establishment of other manufacturing industries which heretofore have not been considered practicable. The development of the sugar beet industry alone has been remarkable, and new factories are springing up all over the West.

"Good prices for farm and ranch products appear to be safe for a number of years. Land values being low

in intermountain and Pacific coast territories, as compared with States east of the Missouri River, it is safe to assume that the increase in values of farm lands recently noticed in many western States will continue, and as the farms increase, so will the values of city property.

"The development of the plains region is wonderful. If improved farming methods are continued it is probable that during the next two years 1,000 new families each month can be placed upon the plains district east of Denver. With proper laws regulating the distribution of public lands this number of settlers can be increased materially.

"All this development means much to the State of Colorado as a land owner. The State now owns about 3,500,000 acres of land. The Campbell system of soil culture and other improved farming methods will add millions of dollars in the next few years to the value of lands owned by the State. The land agents of Colorado can now tell a good story and have every reason to expect a good business during the coming year."

OGDEN RIVER STORAGE RESERVOIR.

Will Be of Great Benefit to That Part of Utah.

The preliminary work of another storage reservoir in Ogden canyon is nearing completion. It comprehends the storage of the flood waters for irrigation purposes, and the installation of a power plant of 2,100 horse-power electric capacity.

The new company will be known as the South Fork Power and Irrigation Company, and its organizers are practically the owners of the Ogden Rapid Transit Company and allied companies. The site selected is in the South Fork of Ogden canyon, where an immense dam will be constructed to store the flood waters. This project will be not in the least in conflict with that of the Pioneer Power Company further down the canyon.

The new company has already spent \$7,000 on preliminary work. Two sites for a dam have been explored and on the upper, which is at Cobble creek, much of the preliminary work done will be available for construction, if this site is selected.

Here a dam 850 feet in length at top, 300 feet at the river and 110 feet high is to be constructed on the most approved modern plan. It will form a reservoir two miles back through a region where the land is not capable of cultivation, and will store about 1,000,000,000 gallons, or the equivalent of 20,000 acre feet, sufficient to irrigate 30,000 acres, ordinarily. The area of this reservoir will be something over 600 acres.

The second proposition is for a dam about one and one-fourth miles lower in the canyon and comprehends a dam 160 feet high, 630 feet long on top, 100 feet at the river bed, and having a storage capacity of 50,000 acre feet.

In either proposition there are ample power possibilities. It is expected to generate 2,100 horse-power, and of this the street railway will be a market for 7,000, leaving 1,400 horse-power for sale. Work on the project has been progressing all summer, and will continue until frost.

This project, taken in connection with that of the Pioneer Power Company, means the storage of sufficient water to reclaim 90,000 acres of now uncultivated lands north and west of Ogden.

FEEDING ALFALFA TO HORSES.

BY I. D. O'DONNELL, BILLINGS, MONT.

It seems to be the general opinion that alfalfa hay is not a good horse feed, and especially for horses on the road or for fast work. Now I would like to correct this, as alfalfa is too good a feed to be condemned for any purpose. The fact is nearly every one who feeds horses feeds them too much hay. The same would apply to all kinds of hay. If you give a horse about what alfalfa he should have, say twelve to fifteen pounds per day for horses of 1,000 pounds, and a fair grain ration, you will find he will travel just as far and just as fast as with other kinds of hay and be in better condition.

But if you allow your horse to eat thirty to forty pounds per day, which they will of alfalfa if you give it to them, you are sure to have a horse that is short-winded and sloppy. One of the famous trotting horses on the eastern turf, with record below 2:03, is fed alfalfa as his only hay.

A good ration for the horse of any kind of feed is about one pound of grain and one and a half pounds of hay to each one hundred pounds of horse. And this would apply to alfalfa. In fact, the horse should do better on the alfalfa than with other hays, and with less grain.

This might be the opportune time to say that the majority of farmers feed too much hay of all kinds to their horses. In fact, the horse barn to my notion is where one of the greatest wastes of the farm can be found. Horses would travel better, stand more work and be healthier if fed less hay, the most farmers give them all they can eat and aim to have them waste enough to make their bedding, when they have plenty of good straw going to waste on the farm.

The London cab horses, which are considered the finest and best kept horses in the world, have but two hours in the morning and two hours in the evening, with noon hour, for feeding. At eight o'clock in the evening every scrap of feed is taken away from them and they are bedded for the night. The Montana farmer would think his horses were being starved if he found no feed in the manger after eight or nine o'clock in the evening.

The feeding of alfalfa to horses does away with the old time brand mash once a week, which was considered so necessary.

A great many alfalfa feeders have from experience decided that the first cutting of alfalfa is best for horses, or alfalfa that is fairly coarse, or some that had come to full bloom; the idea is (though they do not know it) that in feeding that kind of alfalfa the horse gets about the amount he should have. The horse picks it over and takes the best of it and manages to get about what he should have. If they were to give the horse same amount of good, well made alfalfa hay he would eat it all; then he would have too much.

An overworked horse, or one run down and thin, will pick up and get fat and in good condition on alfalfa pasture quicker than on any other pasture known. And where a grain ration is added they have been known to put on as high as six pounds per day.

Horses will eat and do well on the refuse from sheep feeding lots where alfalfa has been fed, while cattle will not take to it.

IRRIGATION IN EGYPT.

That the engineers of today are tackling the same irrigation problems in Egypt that the ancients essayed 4,000 years ago speaks much for the worthy purpose of our scientific efforts, however little satisfaction it yields on account of industrial progress. Like all modern enterprises in Egypt, it is likely to demonstrate the reality of another "lost art."

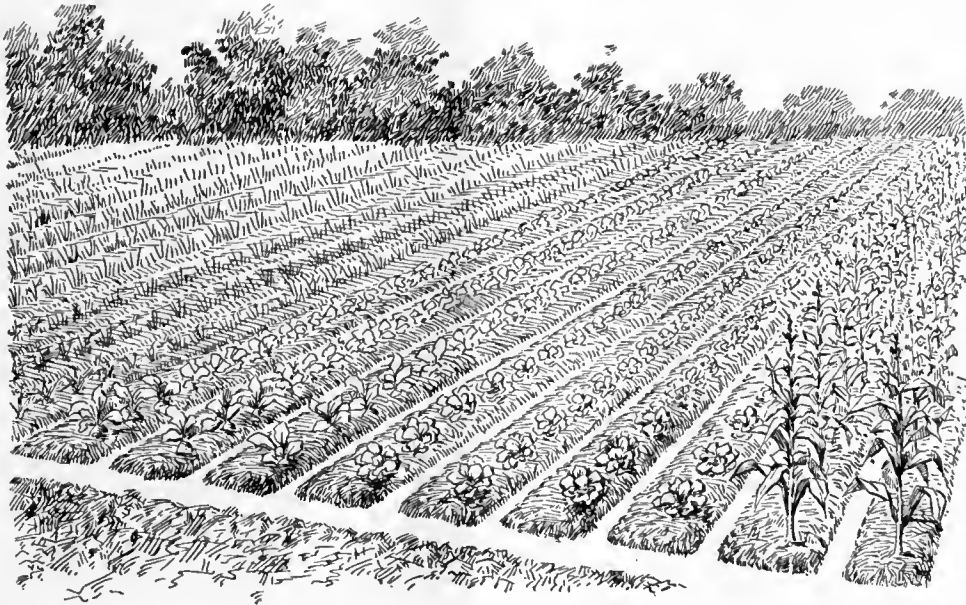
To a leading article in *Engineering* we are indebted for a clear statement of present conditions in Egypt so far as they relate to irrigation problems.

In the first place the cultivable soil of the country owes its origin entirely to the accumulated deposits of silt brought down annually by the Nile floods. In the absence of rainfalls, the soil is dependent for both moisture and fertility upon these inundations.

Diodorus, Strabo and Herodotus have independently borne witness to a vast artificial lake or reservoir, which was constructed to receive the superfluous water

turies of neglect, and the lake vanished, but the depression remained, as a fertile valley in the desert.

When, in recent years, the control of Egypt was undertaken by western nations it was seen that one of the most important things to be done was the regulation of the Nile and the control of irrigation by the construction of proper irrigation works. The irrigable area of Egypt is placed at six and a quarter million acres, and there is an ample supply of water in the Nile for the purpose, providing that the superfluous flood water is stored for use in the dry season. At the present time four million acres are perennially irrigated, and one-quarter of a million acres lying along the edge of the deserts must remain irrigated only in flood time, leaving the great area of two million acres yet to be dealt with. Since a storage capacity of two milliards of cubic metres of water are required for each million acres, the problem is that of providing reservoir capacity for four milliards of cubic metres of water. At its present level the reservoir formed by the dam at Assouan stores but one



Furrow Irrigation.
[From the Primer of Irrigation, Page 150.]

from the Nile at flood time, and to distribute it when and where required by means of canals. The latter writer is enthusiastic in his admiration of the work, which he classes far above the mighty pyramid of Cheops as an example of the triumph of human skill and labor over natural obstacles. This lake—Moeris—was dug by the orders of King Amenemhat III, who lived about 2000 B. C. It had a superficial area of 950 square miles, with a depth in places of 300 feet. It was connected with the Nile by a canal ten miles long and 300 feet wide, controlled by means of sluices, which served to draw off the surplus water from the river, and return it at periods of low water.

As all who have followed the recent history of Egypt will know, the site of the ancient lake has been identified beyond doubt with the present province known as the Fayoum, by Mr. Cope Whitehouse, whose researches have not only abundantly justified the classical historians, but have had a most direct bearing upon the problem of the irrigation of Egypt at the present day. The canal to the Nile had become silted up during cen-

milliard of cubic metres, or only one-fourth of the required amount, leaving three milliards of cubic metres to be provided for.

In seeking for a reservoir for the supply of Egypt during the dry season, it is not to be wondered at that the reconstruction of the ancient Lake of Moeris should have been carefully considered. As, however, in the bed of the lake is a fertile province with a cultivable area of 400,000 acres and a value of £80,000,000, its construction on its original site is out of the question; but there exists a smaller depression in the Libyan hills immediately to the south to which no such objections apply. This depression is known as the Wady Rayan, and Mr. Cope Whitehouse, the discoverer of Lake Moeris, has for years insisted that in turning the Wady Rayan into an artificial lake or reservoir lies the true solution of the problem of Egypt's water supply. Its area at a level of twenty-nine metres, about that of the sea, would be about 700 square kilometres, or 270 square miles. When full its greatest depth would be seventy metres, though only the upper four or five metres would

be used annually, giving a possible supply of some three milliards of cubic metres out of a total contents of twenty milliards. Such a lake, however, would have one great drawback. Although during the month of April it would give a plentiful discharge, by the end of May its level would have so diminished that it could not give all that lower Egypt requires. By the middle of June it could not meet half the demand upon it for water, and a fortnight later it would be practically useless, as its level would have sunk approximately to that of the Nile. For this reason, by itself it would be inadequate, but, fortunately, we have at hand a means of contributing to the summer supply from another source. The Assouan reservoir, owing to its height, can be drawn from at any season of the year, and it is proposed by Sir W. Willcocks to raise the dam by six metres, making it the height originally intended, and use the water so stored to supplement the Wady Rayan discharge, thus maintaining a constant total discharge throughout the

were rejected, not because of any engineering reasons, but because the government considered it preferable to leave a great part of Egypt unwatered rather than allow private enterprise to obtain command of any part of the national irrigation. However, whether it is to cost £600,000 or £2,600,000, the outlay will bring an enormous and immediate return, and the names of those who have assisted in bringing it to completion will deserve remembrance among the greatest benefactors of Egypt.

BOISE PLANS TO ENTERTAIN.

The National Irrigation Congress.

In a recent issue of a local paper Mr. Montie B. Gwinn, chairman of the executive committee of The National Irrigation Congress, is spoken of as follows:



Diverting from a Small Stream with Rapid Current.
[From the Primer of Irrigation, Page 151.]

summer. The Assouan reservoir would, when raised, yield a supply of two milliards of cubic metres, and this would not be drawn upon until some time during May. As the summer came on the proportion of water from Assouan would increase, until in July it would be giving practically the whole supply. Working together in this manner the lake and the reservoir would provide the whole of the water needed for the irrigation of Egypt.

The estimates of cost of the Wady Rayan scheme, according to Sir Wm. Willcocks, amount to £2,600,000.

Mr. Cope Whitehouse, who first proposed the use of the Wady Rayan over twenty years ago, and who undoubtedly has a most intimate knowledge of the local topography, maintains that the entire work necessary can be done at a cost of £600,000. He has offered many times to undertake the contract for the work on the basis of this estimate, or to carry it out as a private speculation, subject to equitable terms of purchase by the Egyptian government when completed. These offers

Montie B. Gwinn, chairman of the executive committee of the National Irrigation Congress, has returned from his recent trip to Salt Lake, where he went to advise with General Manager Bancroft and General Passenger Agent Burley of the Short Line on many questions of importance regarding the next session of the Congress which is to be held at Boise, probably in August or September of next year. At his office in the Sonna block Mr. Gwinn talked of the result of his trip to a *Capital News* reporter. Mr. Gwinn said:

A PIECE OF GOOD FORTUNE.

"Of all the great pieces of good fortune which has blessed the State of Idaho, none has ever equalled the securing of the fourteenth National Irrigation Congress. It may seem a little early to talk about it, for the date at which the Congress will be held has not been fixed by the committee, but the time is with us right now to begin making preparations and arranging our plans to care for and entertain a vast number of delegates that will visit Idaho on that occasion.

MORE THAN 1,000 VISITORS.

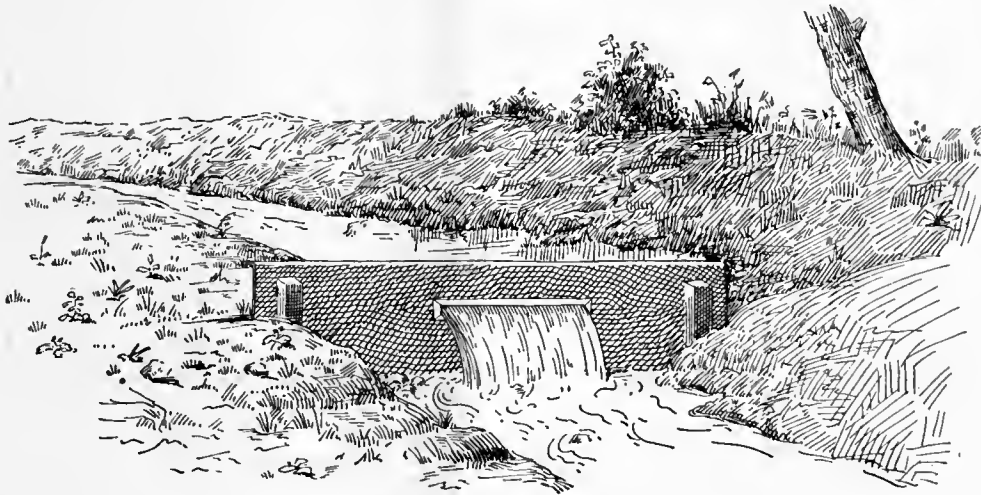
"While the sessions are to be held in this city, in my judgment this is a State affair, and our plans should be made as broad and as extensive as the occasion is big, securing to the State, and especially southern Idaho, all of the benefits that will come from our opportunity to entertain the 1,000 or 1,200 delegates that will be here to see irrigation practiced in the most practical way. The men who attend these congresses are practical men, who come here to see what Idaho is doing, and the impressions they will take away will do us more good than all of the advertising we have ever had. We secured a great victory when we landed the Congress, and now we must secure a greater victory in the way we handle it.

RAILWAY'S CO-OPERATION.

"I went to Salt Lake for the purpose of consulting with the railroad officials in the matter of laying the foundation plans of the entertainment, and I am glad to state that my conference was more than satisfactory,

holding the coming session in the capital city. It isn't enough that our visitors shall see Boise, and learn all there is to know of our city and what there is here. We must let them see what is behind the city that has made it and what will continue to make it a great commercial center. To that end we talked of excursions to be run from Boise, probably after the Congress adjourns, to Weiser, the Payette, the Boise valley, Snake River projects at Twin Falls, Idaho Falls, Blackfoot, and St. Anthony. They will have so much theory while in session that we must not overlook the practical side of the question, for it is in that we will get a return for our work and the money we spend in entertainment. At every place the excursions visit the farmers will have a display of the products of the field and orchard, and after they have gone away Idaho will be the talk of the country, and the talk will be of the kind that counts.

"For these excursions the rates will be such that we can make the trips complimentary to our invited guests, and those who have to pay will be glad to do so.



Measuring Stream by Miners' Inch.
[From the Primer of Irrigation, Page 202]

for I found that they stand ready, willing and anxious to aid us in every possible way to make the sessions a magnificent success. They will not only give us their time and experience and advice in all matters where their help is needed, but the substantial aid in the way of trains and rates, and special cars, and the many things a railroad can do when they believe in the benefits to come from the good impressions that will follow success.

"I was surprised to learn that Mr. Burley has statistics compiled, showing all of the irrigation projects in the State, the miles of canals built, those under construction, the cost of each, and the number of acres being watered. These he will have put into shape to be used in showing to what a great extent the industry has advanced in the State, and the railroad will do its full share in exploiting our resources in every way.

POST-CONGRESS EXCURSIONS.

"We discussed many things, in an informal way, of course, but enough to give me many ideas of the best plans for securing the full benefits to be derived from

VETERAN CONVENTIONERS TO AID.

"I am receiving letters every few days from Governor Pardee, of California, president of the Congress, containing valuable information, and showing the great interest he has in the success of the coming meeting, and Tom Richardson, of Portland, who knows more than anyone about pulling off big things, has asked me to call on him for anything he can do to help. Scores of others have already volunteered their assistance. The meeting is looked forward to as to be the most successful ever held, because here there will be no counter-attractions, and the time of the sessions will be devoted to the irrigation business."

BOOTH A HOST IN HIMSELF.

"I wouldn't feel so confident of the outcome of the work ahead of us but for the fact that with me is President Booth, of the Chamber of Commerce, who is assistant secretary of the Congress. He not only knows what to do, but he is a man that does things. He knows men and methods, and he realizes what success will mean to Boise and the whole State.

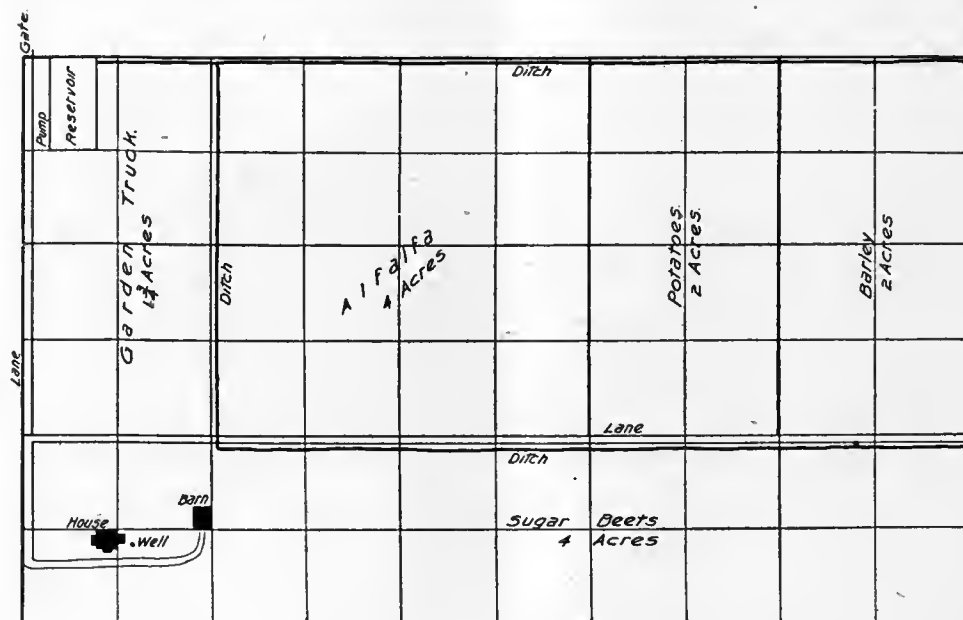
MR. GWINN OUTLINES ORGANIZATION.

"It is going to take a good deal of money to carry out our plans, but it will be the best money we ever spent. Our first step is to form a local organization, and this should be begun at once. We must get together a committee of the best workers in Boise, and to add members from all of the surrounding towns, men who will take a lively interest in the matter, and who will not think it is too early to go to work at once. Plans must be outlined for raising a large sum of money to be used in defraying the legitimate expense of entertaining the large delegations that will come. With this done, the rest will be comparatively easy. A number of plans have been suggested as to the best way to accomplish this, which will be made known as soon as they are decided upon. The one thing that we are determined on is that Boise and Idaho will be remembered as having been the place where the Irrigation Congress reached the climax of its glory in a most successful convention."

told and shown and shown and told ten thousand times ten thousand that if they would simply build an open ditch to turn the flood waters, often called the winter waters, of the Umatilla River onto the land south and southeast of Irrigon, that they could turn some 50,000 acres of six-bit land into \$100 land—and all at an expense of less than \$100,000, or practically for one-half of what they have spent in going over the very same land, digging holes and test pits in it, assaying it, analyzing it, smelling of it, sifting it, sorting it, tasting it, bottling and labeling it, and sending it on to Washington as "Exhibits A to"—well, God alone knows.

The work asked was in no way an experiment. The engineers have been shown a thousand times over on Butter creek alfalfa lands, now worth \$100 per acre, that never get a drop of water save when the Umatilla or Butter creek is at flood. And these lands were absolutely valueless until they got this water.

"The feasibility of the scheme for the government,



Showing Method of Making Map of Land.
[From the Primer of Irrigation, Page 122.]

GOVERNMENT IRRIGATION.

Mr. Bennett, editor of the *Irrigon Irrigator*, has learned at last that the Reclamation Bureau is not the infallible institution that some of his former editorials led us to believe. Mr. Bennett will learn much more of the failures and mistakes of this department if he will hold his ear to the ground during the year of our Lord 1906. We quote as follows from a recent issue of the *Irrigator*, headed "Government Irrigation":

"It is now reported that the Umatilla government irrigation project has been permanently and finally abandoned. So the telegraphic dispatches from Washington stated on Sunday last. As a matter of fact it was found over a year ago that the scheme was impracticable; but those in charge of the preliminary work held on and on and kept spending money, in a way that a private individual or corporation would have considered unwise, to say the least.

"And yet Mr. Newell and his underlings have been

and its impracticability for private or corporate interests, has been time and again pointed out by such men as ex-Congressman Malcolm A. Moody, United States Senator C. W. Fulton, Gov. Geo. M. Chamberlain, Congressman Williamson, and practically every citizen in the vicinity of the lands.

"But no. There would be no glory in the simple diversion of a couple of hundred cubic feet of water, which would only mean the reclaiming of a few thousand acres, and the adding to the crops of Oregon at least a million tons of alfalfa a year, or to her income, say, \$3,000,000 per annum.

"And again, the scheme would be too easy, not complicated enough, not giving enough work for the legal branches of the service. And so the whole field is abandoned, after an expenditure of probably \$200,000 in experimental work.

"But the end is not yet, for there will be a change in the reclamation service some of these days."

THE IMPROVEMENT OF THE COMMON HIGHWAYS.

BY PROF. J. J. VERNON,

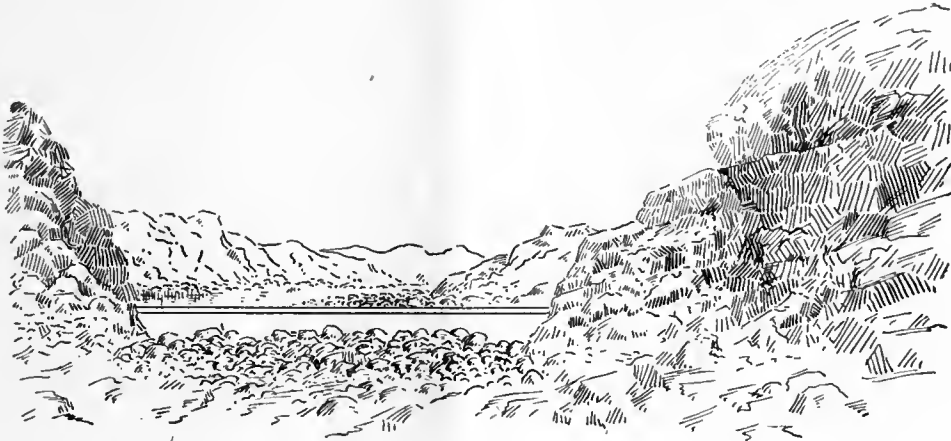
New Mexico College of Agriculture.

Good roads are indicative of a high state of civilization. The improvement in the condition of the common highways proclaim, in mute yet unmistakable language, the advancement in the civilization of a country. Highly specialized industries, which usually attend upon a high state of civilization among a people, seldom flourish where means is unprovided for a quick exchange of commodities. As the standard of living in a community rises, it soon finds expression in a demand for better roads—roads suitable for the gentleman's saddle horse, for the family carriage, for the salesman's road wagon, for the deliveryman's auto-car, and for the pleasure seekers' and tourists' automobiles.

The most natural system to follow in road building

a given kind of work in a day as ten men could perform in the same time with teams and the old slip scrapers, it is evident that the purchase and use of such a machine, provided, however, that the price was not exorbitant, would be most desirable and would result in much economy. Furthermore, if, at the same time, with such a machine the work could be done infinitely better, it would seem to be the height of folly not to invest in one. The modern road-grader is just such a machine. The road-grader has become so popular in most of the older States today that the old slip scraper is seldom seen, and when it does appear it is used only in corners where the grader can not reach the work. With a modern grader in the hands of an expert in every county, the roads leading out from our cities and towns would soon discard their shrunken appearance and take on a more rounded elevated form, and the holes and inequalities would gradually disappear, leaving a surface so uniform that they would delight the eye and afford pleasure to the traveler.

Space will not permit of an extended discussion of



Dam in Dry River.
[From the Primer of Irrigation, Page 151.]

is to begin the improvement in the city or village, working outward in the different directions on the lines of least resistance, but at all times striving to reach the greatest population and the heaviest traffic.

The work should be placed in charge of a man who understands road building and road repair. This statement is equally true whether there be much or little money available for the work. The system which permits the appointment of men as road supervisors regardless of their fitness for the position is accountable in a great measure for poor roads and for the feeble interest taken in road improvement. Probably there is no more road work in many counties than could be superintended by one man, and that man could be selected with an eye to his qualifications for the work to be done, which would result not only in better roads, but also in greater efficiency and economy. Such a system prevails in many of the older States of the Union, and it has been suggested that it might prove most desirable in this section under our conditions.

The use of improved labor saving machinery in the building and repair of the common highways, no doubt, would result advantageously to all concerned. To illustrate: If a machine were devised whereby two men and four teams, with the machine, could perform as much of

the methods and means for road improvement, but at least enough has been said to introduce a subject which is deserving of much thought among the people of this section. We are on the eve of a great wave of progress and would it not pay both the merchant and the ranchman to give the matter of road building and road repair more attention?

COMPLAINT ABOUT RECLAMATION BUREAU.

The following communication, signed by Mr. Fred R. Reed, one of the best known men in Idaho, appeared recently in the Burley (Idaho) *Bulletin*, and treats of conditions which have been mentioned before in these columns. In Mr. Reed's letter he says:

"The writer drove over the settled part of the tract today and was pleased and gratified to note the growth and development on every hand. The people on the north side of the Snake River will have water for their lands next spring (1906); on the south side of the Snake River no time is fixed for the completion of the gravity and pumping systems. Hundreds of settlers are anxiously waiting for some reliable information as to when they may be given an opportunity to buy water of

Uncle Sam, so that they may place their homesteads under cultivation and make a living. The people on the south side located on the lands because it was under the fostering hand of the United States government and part of the great *Minidoka reclamation project*. Just as much so as on the north side, they as citizens are entitled to all the word implies. They are poor people, most of them, who have all their world's belongings with them. Most of these locators have wives and children. They are waiting, living on the desert, many of them hauling water miles to drink and for domestic purposes. The locators are good citizens, law abiding, patient and brave. All they need to make them the happiest of people is word from headquarters that *water* will be ready for their lands within a reasonable time. Uncle Sam is not giving them anything except an opportunity to work, for which opportunity they pay Uncle Sam the market value. It makes no difference on which side of the Snake River people are located. The plans of the Minidoka reclamation project carry with them no gifts or presents for the settlers. What the settlers may expect to receive as their reward after they pay the acreage debt for water rights and secure titles to their land is the difference between the actual cost and the selling price per acre, which will be between \$27 and \$28 per acre. This is first cost. In the judgment of the writer these acres will sell from \$75 to \$100 per acre in five years. Now, homesteaders who will have water next year can go ahead and make a living. But the hundreds of good people that are "doing time" on the south side, what about them? When can they hope for relief? When do they get water? If they are trespassers within the confines of the government's great irrigation project; if they are aliens and not eligible to the benefits of citizenship, it is Uncle Sam's duty to cancel their homestead entries and dispossess them of their holdings. If they are right, as they are, they are entitled to some authentic, reliable information so that they may know what to do and what to expect. It is not the intent of *this* article to insinuate, to cast any slurs on the reclamation service, or its officers, or accuse the government of double dealing. There is nothing intended to offend. There is, however, a determination on the part of the writer to help the settlers of the south side to secure information that is bread and butter to them.

"What the homesteaders on the south side ask for is to have the reclamation service set the time when the relief they pray for may be theirs."

CORRESPONDENCE

SPOKANE, WASH., November 14, 1905.

Editor Irrigation Age:

The Idaho-Washington Land Company, of Moscow, Idaho, bought yesterday from Thomas M. Bruce, James T. Brattain, Myron C. Munger and Henry R. Ochiltree, through the Great Northern Land Company, ten sections of land on Lower Crab Creek, in Douglas County, for \$28,827.

About half of the acreage is good bottom land, capable of irrigation, and there is ample water to be had for this purpose. It is understood that this is the intention of the purchasers.

The Idaho-Washington Land Company was recently organized by Moscow and Minnesota men, and this is the first purchase made.

The property was bought three years ago by Messrs. Bruce, Brattain, Munger and Ochiltree from the Northern Pacific Railway Company for \$8,000, under contract, and only a small cash payment was made, and the full purchase price has not yet been paid. No improvements were made, but about 400 acres have been in meadow each year. The sale yesterday represents a handsome profit on the money invested.

CODY, BIG HORN COUNTY, WYO., November 11.

Editor Irrigation Age:

The big steam shovel of the Big Horn Development Company, which was moved on its own track from Cody to the scene of operations on the south side of the Shoshone River, is now working and the big canal is being excavated rapidly. This canal will be thirty miles long and will divert water from the Shoshone River to the Oregon Basin, a large natural reservoir, covering over 5,000 acres and capable of holding sufficient water to irrigate the 200,000 acres to be reclaimed for a period of two years without additional water flowing in. From the reservoir the canal will be constructed a distance of forty miles. It is hoped to have everything in readiness to run water on the land in the spring of 1907.

The Oregon Basin project is the one that was held up by the Government for several years, the engineers of the Government reporting that it would militate against the success of Uncle Sam's Shoshone project. The State officers showed that it would do nothing of the kind, however, and after a long fight, in which the State authorities held up the title to water under the Government enterprise until the department approved of the segregations under the Oregon Basin enterprise, the matter was finally settled and work was started on both projects.

LAWTON, OKLA., November 15.

Editor Irrigation Age:

The Navajo irrigation project for southwestern Oklahoma is now hanging in the balance and will in a very few days tip one way or the other. The Government board of consulting engineers is now on the ground, and upon their final decision will depend the fate of Oklahoma's \$2,000,000 project for reclaiming a section of the semi-arid land in the West. The board is composed of B. M. Hall, of Carlsbad, N. M., chief engineer of the reclamation department in the southwestern division; A. P. Davis, assistant engineer, with headquarters at Washington, and William Sanders, of San Francisco, an engineer of the reclamation service in the western division.

The board is making its headquarters at Synder and is investigating this week every feature of the irrigation project. They are going over the ground, examining the water supply, the drainage, the flow of the streams and the plats drawn by the execution of the project. The late investigations of Engineer J. J. Camp, chief officer, now in charge of the project in the field, to ascertain the existence of bedrock in the streams and its depth from the surface, have resulted successfully and most favorably to the project. This was the vital point on which the irrigation matter has been resting for the past few months, and at one time it appeared that the project would have to be abandoned on account of the absence of serviceable bedrock at a reasonable depth. Such items as salt, sand and sediment are yet to receive the consideration of the board.

It is estimated that the 22,000 acres of land to be condemned for a reservoir will cost the Government \$20 per acre, or a total cost of \$440,000. All the land to be condemned is homestead land and most of it is now being lived upon and cultivated by farmers. Inasmuch as the present owners must vacate and afterward the lands are to be worthless, save for reservoir purposes, the homesteaders will doubtless demand of the Government prices not lower than \$20 per acre. This means the removal of 137 farmers to other sections of the country.

"I have stronger hopes than ever before that the irrigation project will be carried out," said an engineer of the Geological Survey today. For three years he has been observing the progress of reclamation affairs and is informed in nearly all matters pertaining thereto.

BROWNSVILLE, TEX., November 14, 1905.

Editor Irrigation Age:

J. L. Allen, of Houston, representative of Iowa capitalists, who have recently purchased 8,500 acres of land about twenty miles above Brownsville, says work will begin in a

few days. An engineer is expected soon to look over the ground and the work of putting in ten miles of canal will begin at once. A pumping plant of large capacity will be installed and the land put in first-class shape for agricultural purposes.

ALAMOSA, COLO., November 15.

Editor Irrigation Age:

A big mass meeting of residents of the San Luis Valley is being held here today for the purpose of forming some plan whereby the order of the Secretary of the Interior may be so changed as to permit the building of reservoirs and using the waters that can be stored in them for irrigation purposes. It is claimed that if the obnoxious ruling can be rescinded or materially modified a vast empire that is now barren can be made productive and rich.

The question to be debated is whether or not the Interior Department's order shall be fought in the courts or an appeal made to President Roosevelt. The latter plan is favored and will probably be adopted, but in case this fails then the fight in the courts will begin.

F. H. Newell, head of the Government Reclamation Service in the semi-arid regions of the West, is blamed for the continuance of the anti-reservoir order. He is accused of prejudice against the temperate regions in the matter of irrigation in favor of the semi-tropical sections.

It is affirmed that 100,000 acres of the finest land in Colorado were being held back from development by the ruling of the head of the Reclamation Service to allow a nebular scheme for the reclamation of the same amount of land near El Paso to be reclaimed at some indefinite future date. Mr. Newell holds that it takes from eighty to 160 acres to support a man in the temperate regions, while in the semi-tropical sections ten acres is plenty. On this theory he had continually refused to consider the construction of any large reservoir in Colorado, except the one at Gore Canon, the waters from which will be used on the lands of Arizona and California.

The ruling against reservoirs in the San Luis Valley was made in 1896 and since that time over twenty-five different companies have tried in vain to secure rights of way to build dams that would furnish water for 100,000 acres of rich land in the San Luis Valley.

Mr. Newell has refused the rights of way on the grounds that the Mexican Government objects to the diversion of the waters of the Rio Grande River and its tributaries, but no effort has been made to adjust this difference. Certain El Paso politicians had a scheme to build a large dam near El Paso and wished to use the water that should go to irrigate the land in Colorado. They are trying to interest the Reclamation Service in this scheme and are preventing the water from being used on Colorado lands.

The creation of a forest reserve in Archuleta, Mineral, Rio Grande, Conejos and Hinsdale Counties, as outlined by the Government, is being advocated by the settlers of those sections, but they ask that the usual restrictions be removed in this instance. They claim that the land is not suitable for cattle grazing and that if the sheep are barred it will result in killing the sheep industry of that section.

APPLYING WATER.

When making the first irrigation in the spring more time is required for the water to cover the ground thoroughly than for any of the succeeding irrigations. In a general way for alfalfa it requires twice as long and for plowed land about three times as long. Frost seems to open up the ground and the first irrigation packs it and makes it more solid, so that subsequently the water goes over it much faster. The time required depends upon the slope of the ground as well as upon the nature of the soil, but under similar conditions as to slope, gravelly land requires more time than any other. In irrigating such land the best way is to water only a portion of it and then change the water to some other piece of land, allowing the watered portion of the gravelly soil time to pack. Then turn the water on again and it will travel quickly over the part first

watered, reaching the unwatered land before much water is absorbed.

Farmers claim in a general way that light clay, very sandy and gravelly land should be irrigated three times as compared with twice for loam. If plowed deep in the fall any kind of land will require less water than if it is merely scratched. Sandy land gradually improves with irrigation, changing to a sandy loam in seven or eight years. Sandy loam, with a flat slope and a clay subsoil, when irrigated late in the winter or early in the spring in non-freezing weather, will produce one or two good crops of alfalfa without further watering. In hot weather it is best to irrigate sandy land at night, for if the water is put on in the daytime it is likely to scald the crop.

Comparatively flat light clay land will produce the most alfalfa. The first crop is generally cut late in May on bench lands and early in June on bottom land. The second crop comes on about the middle of July on bench land and before the first of August on bottom land. The third crop is allowed to grow as long as it is safe from frost, being generally cut about the middle of September, although sometimes it is not taken until October. Alfalfa should be plowed under every few years and the land put in grain or sugar beets. For two years after alfalfa has been plowed under wheat will make nearly twice the usual crop. As a general thing, it is customary to irrigate grain three times, although frequently four irrigations are required on bench lands, while sometimes only two are needed on bottom lands.

Grain should be irrigated when it is necessary only. If irrigated often it makes too much straw and is likely to fall down. When wheat is irrigated three times, it is usual to water it first in the boot, generally from the 15th to 20th of May; the second time, when it heads out, and the third time when it is in the dough, just before it begins to ripen. It is customary to irrigate oats three times to make a crop, although sometimes four waterings are necessary on bench lands. The first irrigation is generally about May 15th. Barley requires about the same treatment as wheat and oats, but ripens a little earlier than wheat. On sandy loam, thoroughly cultivated, corn will not need any water until it tassels out. Comparatively flat light clay land and black loam produce the best grain.

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NOTES.

The Secretary of the Interior recently awarded a contract to Orman & Crook, of Pueblo, Colo., for the construction of the Belle Fourche, S. D., dam and distribution canals. The contract calls for the construction of an earthen dam and appurtenances and seventeen and a half miles of canals, involving about 2,600,000 cubic yards of earth work, 3,000 cubic yards of rock excavation, 24,000 cubic yards of concrete masonry, and 45,000 pounds of steel and cast iron.

The dam when completed will be one of the largest earth embankments in the United States. It will be 100 feet high in the highest place, one mile long on top, twenty feet wide on top, with one and a half to one water slope, which will be completely paved with stone to a depth of eighteen inches. The conduit or controlling gates are to be placed in a concrete well located in the center of the fill, connecting with the reservoir and the distributing canal by a three-inch concrete conduit of sufficient capacity to fill the canal when the reservoir is low. In this well three steel gates will control the outflow. When the reservoir created by this dam is full the area of the water surface will be nearly 9,000 acres, and the water will be sixty feet deep.

The canals provided for in this contract are for both sides of the Belle Fourche River. The north side canal, to provide water for 60,000 acres, will have at its head a bottom width of twenty-six feet and will carry a depth of water of seven feet, with a grade 1.056 feet per mile. The south side canal will irrigate 4,000 acres on the north side of the river, emptying a quantity of stored water into the river which will be diverted into a continuation of the canal on the south side of the river and made to irrigate 20,000 acres of the first-class lands in the vicinity of Vale and Empire. The first section of this canal will be sixteen feet wide on the bottom, carry a depth of water of five feet, giving it a capacity of 243 second feet.

The successful bid on the dam was \$879,164; on the north side canal \$71,129.75; and on the south side canal, \$53,005.50. According to the contract the dam must be completed by September 1, 1909; the north side canal by May 1, 1907; and the south side canal by September 1, 1906. It is specified that as work upon the dam progresses the Reclamation Service has a right to store water behind it to such height as the engineer may determine to be safe. In case the work on any schedule is not completed on the date required, a deduction of \$50 per day will be made from the amount due on the contract for such schedule for each and every day the work remains uncompleted.

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RECLAMATION NOTES.

Field work on many irrigation projects throughout Montana has ended for the winter and Henry N. Savage, supervising engineer of three States for the Reclamation Service, has left for Denver. He will go thence to Washington to formulate plans for next season in Montana. Meanwhile the State engineer is making water-right surveys along the Sun River at the expense of the Great Falls business men preliminary to an adjudication of the rights of present settlers along that stream, a settlement of these rights being imperative before the government will do any further work on the Sun River canal project.

Winter work will be continued at the Shoshone dam, which, when completed, will be the highest dam in the world. Survey work is also promised for the winter on other contemplated irrigation projects, both government and private.

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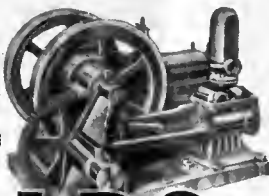
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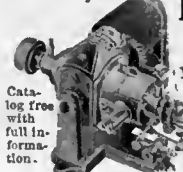
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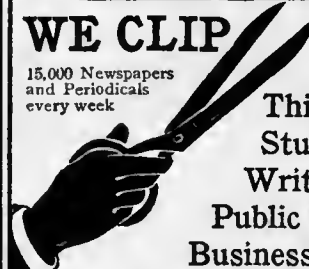
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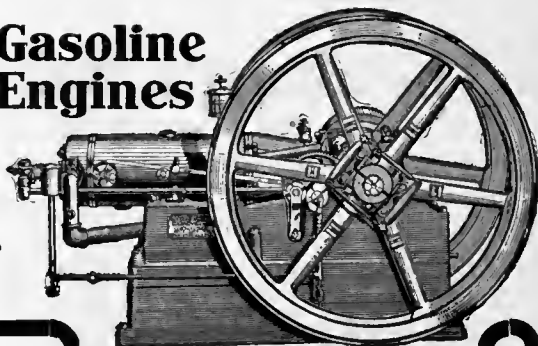
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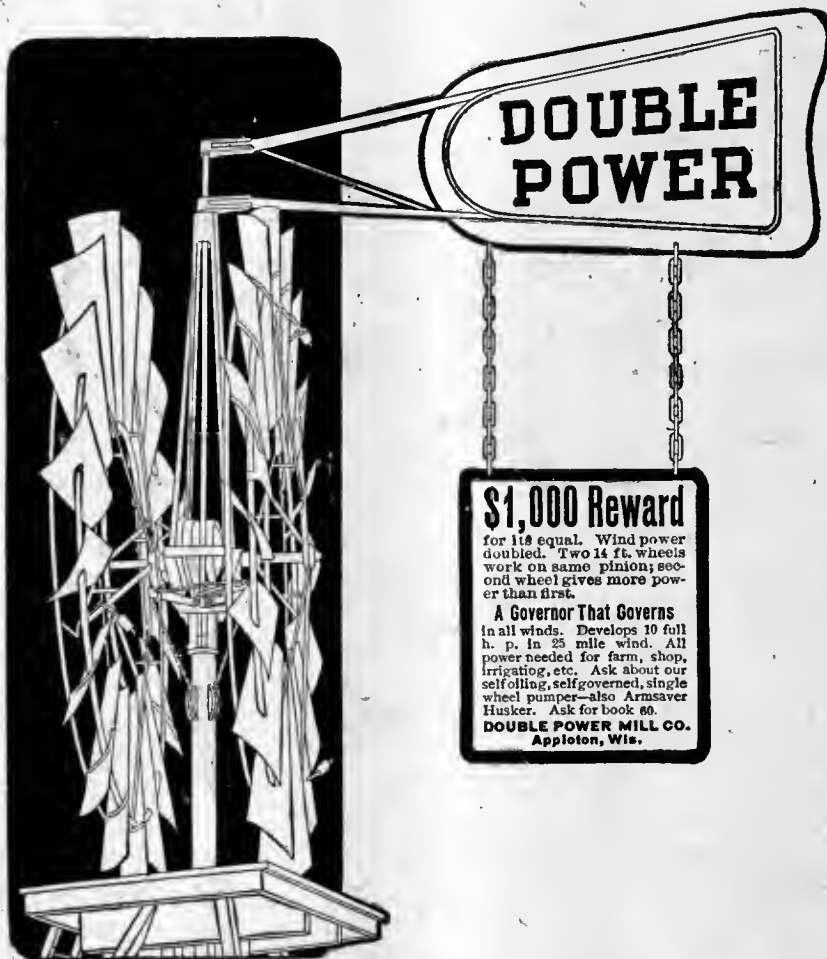
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JANUARY
1906

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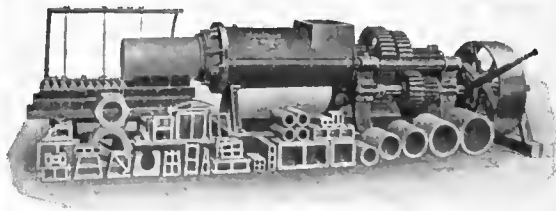
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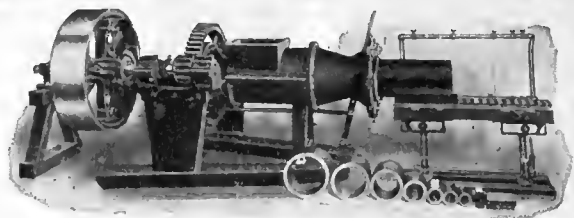
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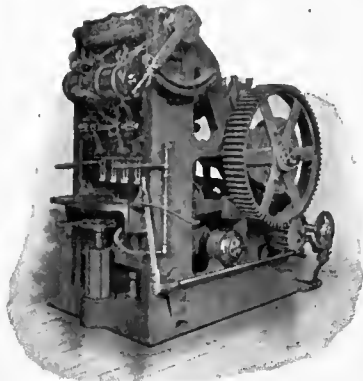




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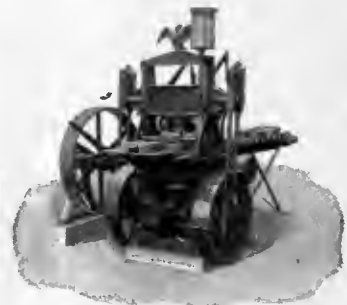
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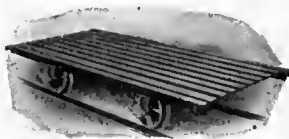
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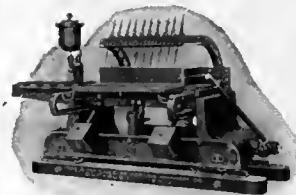
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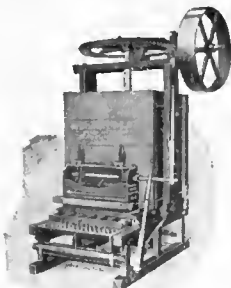
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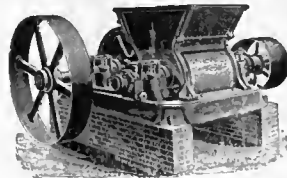
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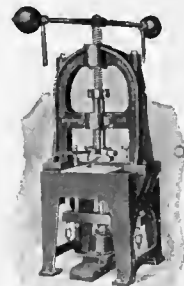
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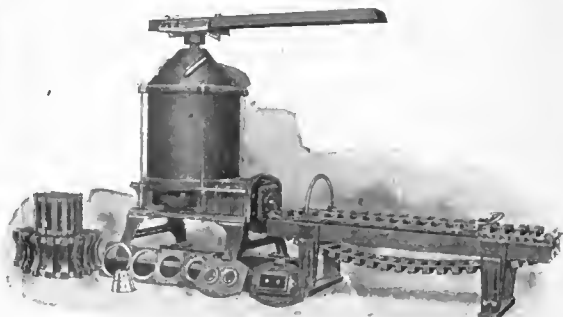
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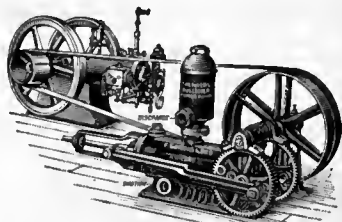


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FIG. 952

HORIZONTAL BULLDOZERS, 3" to 6" CYLINDERS

MYERS
BACK GEARED
WORKING HEAD

TAPPED FOR
3" PIPE

5, 7½ and 10"
STROKE

FOR
BELT, WIND OR
HAND POWER

FIG. 1113

2½" DISCHARGE



BULLDOZER
WORKING
HEAD

1½ BRASS ROD

PISTON
COUPLING NUT

PIPE FLANGE

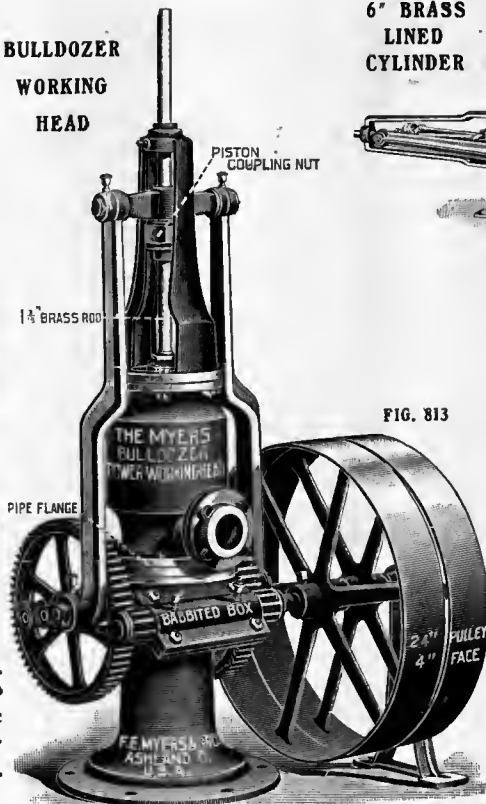
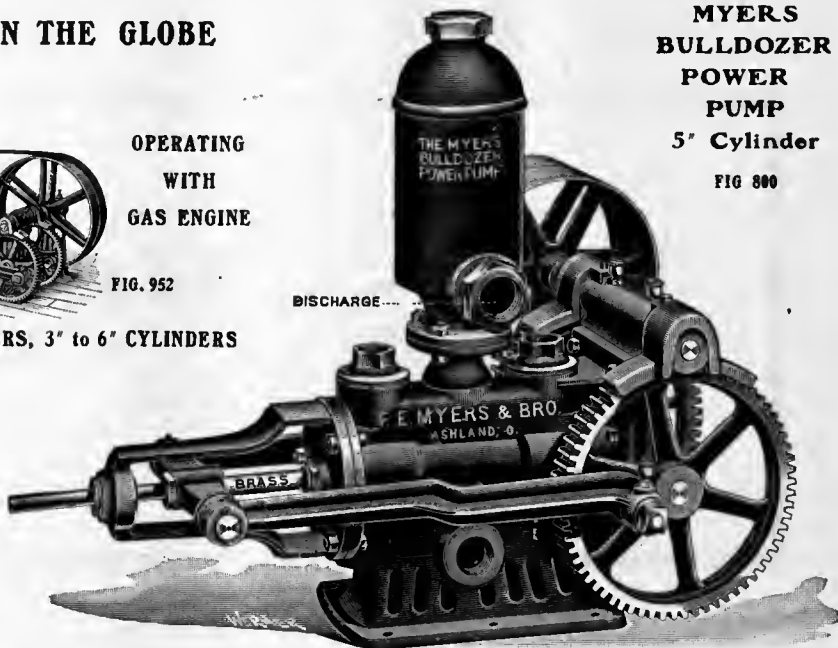


FIG. 813

MYERS
BULLDOZER
POWER
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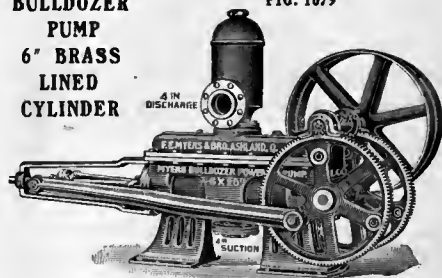
5" Cylinder

FIG. 800



BULLDOZER
PUMP
6" BRASS
LINED
CYLINDER

FIG. 1079



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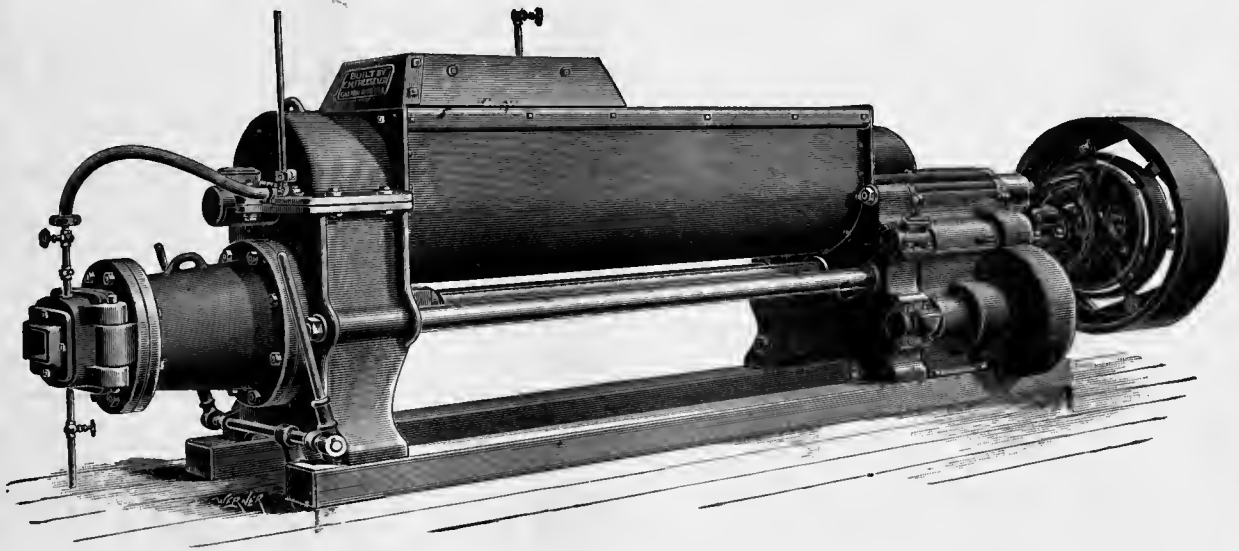
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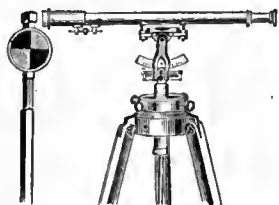
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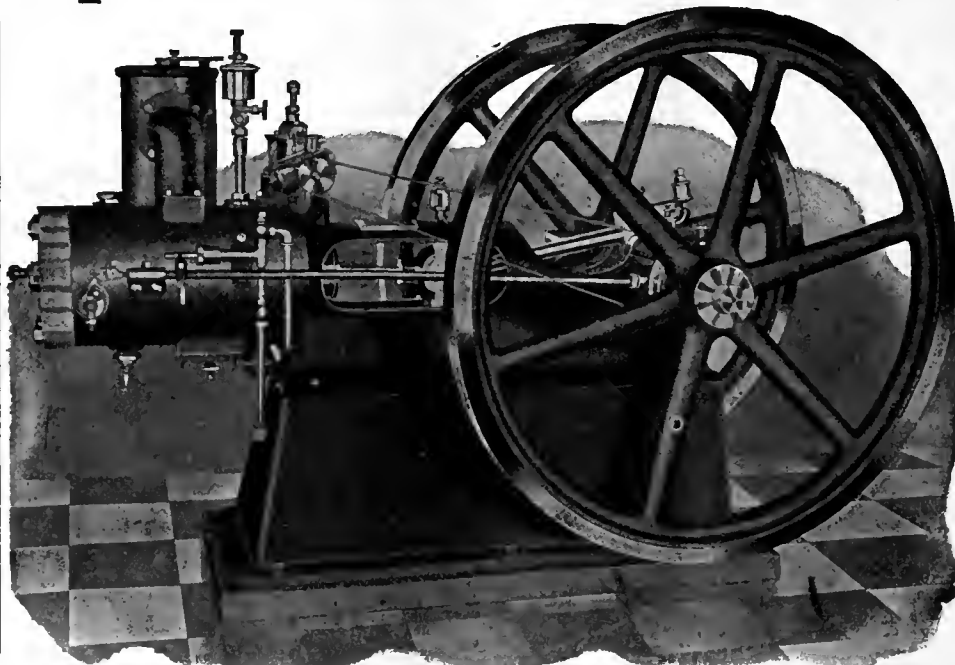
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THE IRRIGATION AGE

VOL. XXI

CHICAGO, JANUARY, 1906.

No. 3

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Failed to Connect.

A rumor is afloat that the head of the Geological Survey has made such representations to the Secretary of the Interior as to lead him to request President Roosevelt to drop Carl Edwald Grunsky as adviser or head of the Reclamation Service. Report further says that the President emphatically declined to remove Mr. Grunsky which is good news to all who are looking for clean work along irrigation lines. To those who are acquainted with inside facts it is easy to trace back to the Newell-Maxwell crowd as the instigators of this move. Director Walcott of the Geological Survey has no doubt had a hand in the deal also. Mr. Grunsky is too good a man to be handicapped by this lot of "halo balancers."

The Union Pacific.

We are representing in this issue three illustrations which were furnished by the passenger department of the Union Pacific Railway. One is an irrigation scene on that railway in the South Platte Valley; the other is a view of onion fields near Greeley, Colo., while the third shows an irrigated wheat field in Dawson County, Nebraska. It is our intention to show during the coming year many views along the line of this railway which will be accompanied by proper descriptive matter.

In connection with the use of these articles it occurs to us that the railway companies of the West are given scant credit for the vast amount of valuable literature distributed through their passenger departments and this we believe is particularly true of the

Union Pacific System. It is not known what department of that well managed system should receive credit for the elaborate and comprehensive reports issued. We presume, however, that the passenger department is responsible and it is not more than fair to say that this class of literature turned out from the offices of the Union Pacific Railway at Omaha is far and away ahead of the average railway literature, in the sense that great care and a vast amount of labor must have been expended in the preparation of statistics which make up these reports. Messrs. Lomax and Fort of the passenger department, as well as Mr. Darlow, of the advertising department of that system, are, no doubt, entitled to a great deal of credit for turning out so much valuable matter.

Organize.

The contests which have been provoked in many localities by over aggressiveness and insufficient tact on the part of representatives of the Reclamation Service and unreasonable demands on the part of prior private interests have wrought incalculable injury to private enterprise, to the Reclamation Service, and the entire West, and unless dealt with wisely bids fair to demolish aspirations of the personnel involved, and menaces many practical plans for redemption of arid lands. The persistence with which the conflict has been provoked, and the autocratic attitude of Federal representatives, is the most discouraging end to encounter. Clothed in the ample vestments of governmental authority a word is far more potent than from the individual. Uncon-

sciously each assertion carries a significance as of eminent and infallible origin.

It seems there is need of an association of fearless men. Men who have at heart the progress and development of a greater West; whose various endeavors shall include the tasks of harmonizing interests, of determining rights where conflicts pend, to exercise its influence with contending elements. It should be composed of men broad enough to see both sides and brave enough to criticize the erring.

The West wants development—all it can get. The National Irrigation Act has inspired confidence in many a lagging enterprise. Promoters with a worthy project heretofore handicapped by want of means, need now only show the merits of their plan and security from Federal intervention, and cash materializes. The national law has done a noble work if it never builds a dam or ditch, and there are many projects where the Government would be a welcome adjunct. It could upon some equitable basis assist construction.

It certainly is not the purpose of the Government to crowd out pioneers. Originators of irrigation in modern America are entitled to their prior rights and privileges, unmenaced and unmolested. It is an imperative duty this generation and the country owes to the fathers of an idea which will build homes for millions from an arid wilderness.

It will take men of courage in such an association, men who care not for blatant criticism of erstwhile sycophants; men who must expect to have their motives impugned and maligned by fortified beneficiaries of this or that contingent. These things, sometimes so important to us individuals, are dwarfed to insignificance when one realizes what it all means to future generations, and all it means for the quick development of the newly irrigated area. Young, untactful men who have been advanced by the rapid growth of the Reclamation Service, are too fond of exercising their new authority, too prone to imagine their work includes stern contests and gives them unlimited privilege. It is unfortunate for those young engineers who are, in the main no doubt, aggressive, ambitious, able and worthy, that the attribute of exciting hostilities and of unnecessary interference with extraneous affairs have found encouragement from higher sources. One almost concludes their actions are inspired and that the original purpose of the National Irrigation Act, which was to foster and supplement irrigation development, is being perverted for a purpose. To square the shoulders and tell of comprehensive brains essential for reclamation heads, and to have the eyes assume an omni-spective luminosity, does not dispel conclusions. Stories of unceasing toil, of days and nights of unwearying labors, yet almost hysterically repudiating plans of relief, exhibitions of morbid sensitiveness when a proposal is

made to improve the business end of the service, adroit coupling of names of independent citizens with antagonists, and no apologies when apprised of errors; all these permit and provoke unbidden apprehension.

Emphasized is the above when engineers of the Government find it necessary to reorganize Water Users' Associations, to commit them to attitudes which deliberate judgment fails to commend; and when a member of the association rises in protest, the beneficiaries busy themselves writing discrediting letters about the timorous individual. Those of the affected district have a privilege which they will exercise. They urge that usual business customs shall prevail in these vast projects.

As Senator Carter said, "Whoever heard of a vast industrial enterprise, a trans-continental railroad, for instance, financed by its engineers?" Let an association be created with purposes advisory alike to corporate and Federal authorities, and it might eliminate much of the personality, censure and aspersion which has heretofore invaded correspondence and conversation. One must learn by criticism and it is hoped that suggestions may be received in friendly spirit and not have any neutralizing effect. Our readers are requested to send in suggestions for the forming of an association of those directly interested, with the end in view of holding meetings where the people may voice their grievances and register complaints against those in authority who pay no heed to the cry of the oppressed.

When a citizen of any community has so lived that his fellow men shun him there are only two paths open for him: one, to look for new fields where he may start anew, or secondly, an effort to live down a reputation unsavory, or bad, by good conduct and clearly understood effort to correct wrongs perpetrated. The extent of man's evil doing is broadened or limited by the size of the community in which he is located. A man may, for instance, carry on badly for a long time in a large city before being found out, while his time would be short in a small town. When an individual has a country as broad as the United States in which to operate he is practically unlimited as to time or opportunity, there being much less chance of his being exposed simultaneously over a large area.

Thus it is that an organization of the character of the National Irrigation Association is hard to down, there being, perforce, so much virgin territory to work even if its weaknesses are made known in widely separated localities. These thoughts are prompted by a letter of inquiry received by the editor recently from a reputable and well known citizen of Chicago in which he says, "Will you be so kind as to tell us from what source such matter as the enclosed emanates?" The

enclosures were a lot of printed sheets containing quotations from St. Paul and Minneapolis papers laudatory of the organization known as the National Irrigation Association.

THE IRRIGATION AGE has made many attempts in the past to enlighten the public concerning the weaknesses of this band of "halo wearers," but it seems that there are many who are as yet ignorant of its plan of misrepresentation and graft.

The fact of the matter is that this organization is being supported by a lot of well meaning gentlemen in St. Paul, Minneapolis, St. Louis and numerous other cities under the misapprehension that it is founded on a clean base and is doing much to assist in the development of the West, by irrigation under Government control. This was perhaps true in the early history of the organization, but is far from being the fact today.

To further enlighten our correspondent, the following facts may be briefly stated:

The National Irrigation Association is not living up to its original plan of assisting the National Irrigation Congress in the way of providing funds to meet ordinary expenses, nor has it ever done so. This association is collecting large sums of money from its members throughout the country and is giving nothing of a tangible character in return.

The ringleader of this association admitted before the Committee on Irrigation of Arid Lands of Congress that its income exceeded \$60,000 per year.

He has also declined on numerous occasions to furnish any public statement of the manner in which this vast sum is expended.

He also poses as the father of the irrigation movement, when in point of fact, he was a struggling lawyer in California when the first real work for national aid was being performed by men whose aims were good and whose motives were clean.

He has secured the support of good business men by misrepresentation.

He has regularly posed as the friend of the homeseeker when in fact he has used every effort to bring about the repeal of certain land laws which would, if carried out, benefit a few large landholders and produce hardship for the great body of homeseekers.

He and his employers have regularly aimed to misrepresent facts, and place the present and future generations in bondage.

This association has done nothing as compared with the work of individuals of whom we hear but little, toward developing the West.

The National Irrigation Association has done much to discredit the land law known as the Carey Act—a law under which many worthy private irrigation enterprises were formed and brought to fruition.

This one-man organization has regularly attempted to hamper all development under private capital.

It has interfered with the conduct of associations of manufacturers when it could and its leader has recently been censured by the Executive Committee of the National Association of Agricultural Implement and Vehicle Manufacturers for undue interference with the plans of that organization.

The National Irrigation Association has been repudiated by the National Irrigation Congress, a worthy institution which it attempted to control and, failing, is now circulating the statement that the usefulness of the National Irrigation Congress has departed.

The Irrigation Congress is a strong body and will not be injured by their statements.

The next Congress at Boise will demonstrate that it is much stronger with that element eliminated.

The leading spirit of the Association has recently made an arrangement at Washington with a prominent lobbyist of large corporate interests to expend a fund which aggregates a quarter of a million dollars annually to educate the public mind to the corporation's way of thinking.

THE IRRIGATION AGE does not attempt to say whether or not this plan is worthy, but this combination takes on a strange aspect when it is known that this individual is spending that vast sum to combat the plans of the President of the United States, whom he loves to quote where the quotations on reform subjects suit his purpose.

The President will, no doubt, be surprised to learn that this man who has so assiduously courted his favor through friends in the Reclamation Service, is in the pay of his (the President's) enemies.

These and other facts innumerable are given as an excuse for our persistent effort to expose a condition of hypocrisy and sham.

Some day perhaps we will know how much money has been paid into the hands of this band.

A remarkable feature of the situation is that such men as Thomas Walsh, of Washington, and such lesser lights as James H. Eccles permit their names to appear in printed matter as officers of this loud smelling organization.

The National Irrigation Association has never done anything in the way of assisting worthy projects to accomplishment nor has its close relationship with individuals connected with the Reclamation Service been the means of benefitting any particular locality save that of the Salt River community in Arizona, where it is alleged a large sum of money, several millions of dollars, are being spent on a dam and reservoir which will irrigate some 200,000 acres of land owned by private parties.

It is further alleged by residents of Arizona that

had this money been used on another project in that territory something near 350,000 acres of virgin land would have been opened for settlement. If this is true it may readily be seen to what extent the National Irrigation Association is a friend of the homeseeker, the toiler, the homeless.

Theodore Roosevelt, President, it may perhaps become you to take on part of what you were once pleased to term "the white man's burden" and investigate some of the vague mutterings concerning the conduct of those servants of the people, the men who compose the Reclamation Service of the United States of America. You are an old plainsman, Mr. President; put your ear to the ground and tell us what the sound indicates.

EDITORIAL NOTES.

BY G. L. SHUMWAY.

The vivid pen picture drawn by November *Talisman*, portraying President Roosevelt standing on the brink of a precipice, was calculated undoubtedly to put the fear of God (or some other Omnipotent) into his heart. It has reached discouraging limits when a mere executive will entertain independent ideas. The presumptuousness is fraught with imminent peril. Nothing should be assumed without first consulting the fountain head which dominates the Reclamation Service. We have long known that immunity from attack on the part of a layman is to possess the attribute of sycophant, or silence. Otherwise reclamation officials will feel called upon to exploit the independent entity as a "disturber" and "unpopular." To set the dogs of its benignant influence lose with sinuous inuendo and malignant fabrication. However, we had not accredited the dictator of the reclamation service with the assurance of undertaking to intimidate the President. The first intimation that anyone believed the element of fear would deter Mr. Roosevelt from executive action is in the emanation to which we refer.

We believe the President will encourage liberal discussion and criticism of his policy, for that will bring out weak points, if any exist, in the alignment of his logic; that his rugged honesty will perceive, and after observation, acknowledge any imperfections in his reasonings; that any argument made which has not been fully analyzed will be thoroughly dissected. If the meat is there, if an available idea is manifest, he will appreciate its merits. In this particular the President and Mr. Newell are the antithesis of one another. While visions of imaginary chasms would reduce the eminent engineer to humbleness and obedience, a threat will rather awaken the combative attributes of our chief executive, and militate against the cause which Mr. Maxwell has obviously been retained to protect.

We are constrained, however, to remark that we doubt the expediency at this time of any revolutionary measure affecting freight rates. Waiving the constitutional question, "Can Congress delegate to a created commission a purely legislative function?" what effect will its action have on the newly reclaimed areas? The several million acres reclaimed will need a rapid influx of population; railroads which penetrate the areas, if allowed discriminative privilege, have a faculty of inducing settlers by establishing attractive rates upon the products peculiar to each community, to the most available markets. If this privilege should be eliminated it would exercise a neutralizing influence upon settlement. The consummation desired; the maximum number of pastoral domiciles, to be established by the effects of a national irrigation act, would be manifestly delayed.

Mr. Maxwell's attitude is, however, most fascinating. As versatile as even he is presumed to be, many have asked how long the hippodrome performance can be successfully maintained with horses headed in opposite directions. A closer observation will detect, however, the reclamation equine is also duly headed down the pike of favorite frenzied financiers. Best principles are violated; but the general public, being unfamiliar with irrigation, see not the motives; only the figure playing well in the limelight as a pioneer of ideas. His sympathies and dictatorial character being so manifest by recent emanations, the national executive may now easily perceive the underlying cause of complaint growing out of a maladministration of the affairs of the Reclamation Service.

THE IRRIGATION AGE has from time to time shown reasons why the service should contain a business bureau, specifically referring to lack of tact and insufficient business methods of those in charge. The Lingle deal is only an example. As has been stated, Mr. Lingle offered the holdings of his company—canal, right of way, water rights, land and privileges—for \$150,000 and no takers. After the execution and approval of his contract with the Government (whereby all the Government secured was a right of way through his canal, by agreeing to convey his water appropriation to his headgates for an inconsiderate sum), his holdings became sufficient collateral for issuance of \$300,000 first mortgage bonds, which have been duly guaranteed. With the reclamation leaning for support so heavily upon the shoulders of Mr. Maxwell—erstwhile booster for the railroads and erstwhile antagonist of executive policies—the President and the people need expect no reform in that department. Attitudes and attributes are inspired by philanthropic profit and one man's glory.

How long it will be possible to keep up this disreputable affront is a question. So long as communications fall by the wayside, so long as complaints fail to reach the executive, and fall into the hands of the Philistines to be duly smothered, it will endure. But when someone with sufficient courage and brains smashes through their guarded battlements and lays the matter before the President himself, then will come the carpet, rack and sifting, which will clear the department of the blot on its escutcheon.

That the National Irrigation Association is insufficient for the requirements of the times, is evidenced by the *Talisman*, which is recently inspired to say that "in all probability the Irrigation Congress at Portland would be the last of any importance." Why the last? Because Boothe and Maxwell are to withdraw their beneficent influence? Do these two men opine that they are indispensable to anything labelled "Irrigation"? This old world has a peculiar attribute of jarring our sensibilities when our opinions of ourselves are unduly elevated.

These gentlemen remind us in a way of Alfred Henry Lewis' pup. After Alfred had shot a bear the pup seized it viciously and violently threw its own little body from side to side, then strutted around on its toes, happy in the delusion that it had shaken the bear. The Irrigation Congress is too big a thing to be even perceptibly jarred by this interesting combination.

What reason is there why the future Congress should not grow in importance as the acreage and number of homes under irrigation increases? Is there any reason why interest should lag even if Boothe and Maxwell were transported? Can a man or institution boast of unselfish zeal for the cause of irrigation and undertake to discredit and destroy the National Irrigation Congress? It is the one place that delegates go without hire and inspired only by the good of the cause. And now the only men who ever received personal advantage from association therewith pronounce its doom. Shall we accuse them of ingratitude and ulterior motives? Or do such suspicions arise from our own stupid, uncomprehending perversity?

Had not the Congress at Portland formally repudiated the National Irrigation Association, the city of Boise and the State of Idaho might have had occasion to rebuke this wholly unnecessary affront. Under the circumstances, however, Monte Gwinn can congratulate his municipality and commonwealth that the Congress to be held in Boise will be free from entangling alliances, and interwoven similarity of names will not confuse us obtuse laymen as before.

OUR FRIEND ORENDORFF.

We are presenting herewith a half-tone portrait of Mr. U. G. Orendorff, who has recently been elected president of the Illinois' Manufacturers' Association. To those who know Mr. Orendorff no word of commendation is necessary. For the benefit of our readers who are not, however, acquainted with the gentleman, we will say that he is one of the best known manufacturers of agricultural implements in the United States, and is an all around good fellow, a sportsman of the cleaner sort, and we predict that the Manufacturers' Association will find that they have as well an extremely able



U. G. ORENDORFF.

man at their head. Mr. Orendorff has been prominent in other organizations of manufacturers, among them the National Association of Manufacturers of Agricultural Implements and Vehicles. His home is at Canton, Ill., where the great manufacturing plant of the Parlin & Orendorff Company is also located. This house is one of the largest of its kind in the world and has branches at Kansas City, Portland, St. Louis, Indianapolis, Dallas, Denver, Omaha, Des Moines, Minneapolis and Winnipeg.

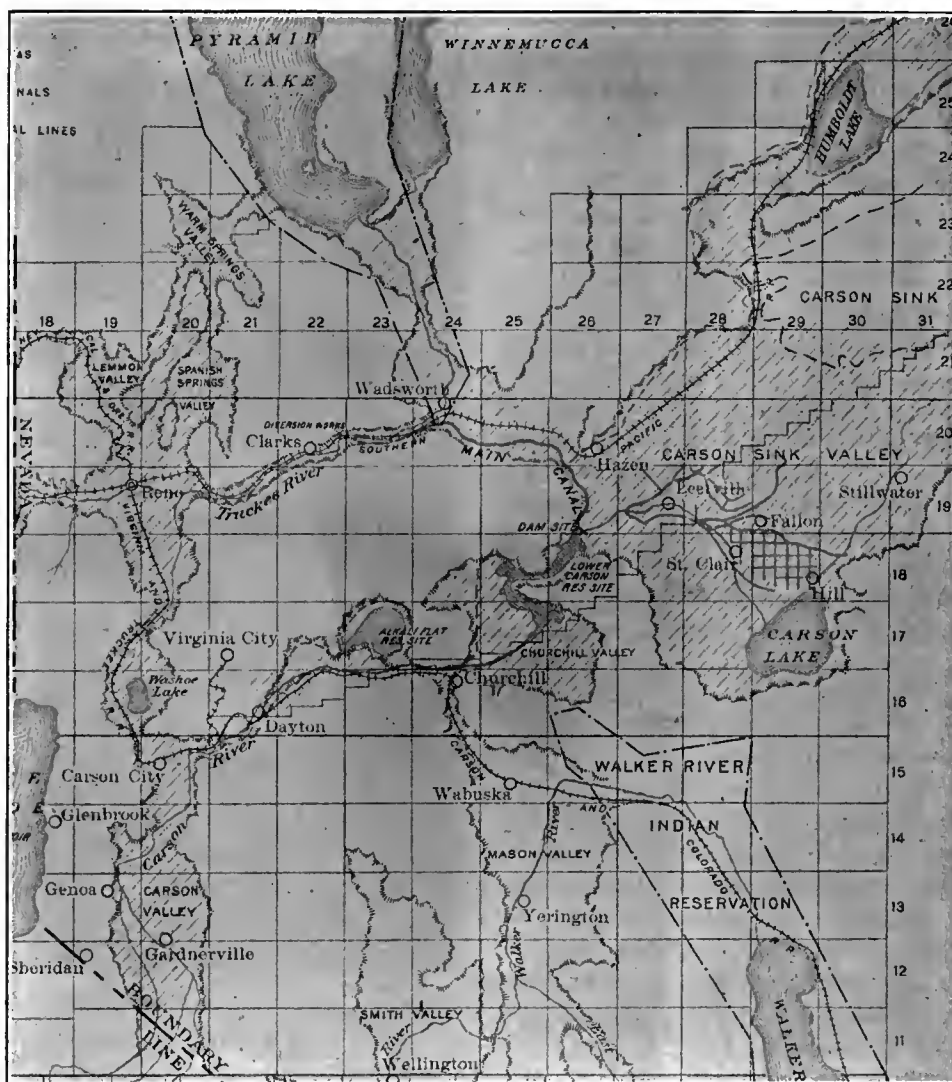
Send \$2.50 for The Irrigation Age
1 year, and The Primer of Irrigation

IRRIGATION IN NEVADA.

BY FRANK J. BRAMHALL.

In the youthful days of even the present generation there was quite a large area of dots on the western part of the map of the United States called "The American Desert." It may have disappeared from the maps but it was nevertheless a desert; and although Sam Davis has written beautifully and poetically of "the lure of the sage brush," the average tenderfoot insists

carry out so stupendous an undertaking, and under the appropriation of \$100,000 by Congress in 1888 Major Powell started surveys of reservoir sites and canal lines and the measurement of the water supply of streams. Mr. William H. Hall was supervising engineer of the investigations in Nevada and California, and Mr. Lyman Bridges was in immediate charge of the survey of the Truckee and Carson River basins. These preliminary surveys were carried on for some years in spite of the lukewarm interest of Congress, which soon discontinued the appropriation for the pur-



Section of Map with Truckee-Carson Project Irrigable Areas Marked by Short Diagonal Lines.

that it is an educated taste. A great part of this desert area is the dried bed of the ancient lake the geologists call Lahontan, but all the elements of fertility rest in those apparently barren sands.

Nevada is essentially an arid region—that is, the rainfall, save in the mountains, is insufficient for cultivated vegetation, yet the waters of the mountains are sufficient for the irrigation of great areas of arable land of the lower plains.

Maj. John W. Powell, then director of the United States Geological Survey, originated the idea of the reclamation of arid lands through irrigation by the general government, which power alone was able to

pose, but in Nevada the work was energetically taken up by Mr. Francis G. Newlands, now Senator from that State. He had surveys made of some of the reservoir sites on both the Truckee and Carson Rivers, purchased lands controlling several of them, and constructed a small dam at Donner Lake. In 1892 he employed Mr. L. H. Taylor to survey a canal line from the Truckee River some twenty miles above Reno to supply water to some 70,000 acres of land to the north and northeast. Mr. Taylor, who is now the supervising engineer of the Reclamation Service in Nevada, has therefore a most thorough and detailed acquaintance with this entire subject, and this, combined with his

practical knowledge and skill, has enabled him to bring the works recently completed to a remarkably successful conclusion.

Under the urgent persistence of Major Powell Congress resumed to a limited extent the annual appropriations for the necessary surveys and preliminary work, which in Nevada were extended from the basins of the Carson and Truckee Rivers to the Walker River and their entire water sheds, including in particular Lake Tahoe, known to all experienced tourists as "the Gem of the Sierras," and the great number of smaller glacial lakes of the high Sierra that drain to the eastern slope.

Gradually, as the knowledge of the subject increased, its great and vital importance was recognized by a larger number, and when President Roosevelt, who possessed a larger and more intimate knowledge of the needs of the great West than any of his predecessors, took the subject in hand it was successfully crystallized

deeper moment than any transformation scene upon theatrical boards. It was a grand stage, where all the world might be spectators, for along its entire front from Hazen to the summit of the Sierra ran the main line of the Southern Pacific in full view of this reclamation work. From the ice-cold depths of the Sierra lakes, Tahoe, Fallen Leaf, Donner and twenty others, tumbled the foamy rapids to lower levels. These sources of supply are inexhaustible, and the joyous vigor of its birth seems to give it strength for the great work of human helpfulness by the transformation of the desert sands. Near the new station of Hazen may be seen the camp of the engineers near the great dam and the heading of the canal. This was doubtless one, and a very important reason, for the straightening of the main line which left Wadsworth off to the north. The main canal is thirty-one miles in length and has a capacity of 1,400 cubic feet of water a second for



Site of One of Reservoirs, Truckee-Carson Project.

in the Reclamation Law of June 17, 1902. Naturally the Truckee-Carson project, previously suggested and developed by Mr. Taylor, and which suggested certain conspicuous features, received the immediate attention of the Government and was the first to be selected for active work as an illustration of what the Government could do in this important field.

June 17 should be a red letter day, not only in the calendar of Nevada but in the calendar of the great West, for three years from the day President Roosevelt signed the Reclamation Law Senator Newlands and the Congressional Irrigation Committees saw the waters of the Truckee River diverted by the immense dam into the great cement-lined ditch that carried it miles away to the thirsty plains awaiting, and inaugurated the first great work of irrigation reclamation by the United States Government.

The three years that intervened saw the work go on in the canyon of the Truckee River and the broader valley below—a play of more entrancing interest and

the first section of six miles, at the end of which a branch crosses the Truckee River by an inverted syphon, conveying 250 cubic feet a second to the reserve lands between Wadsworth and Pyramid Lake, which body of water it was feared would itself become a desert by evaporation when the waters of the Truckee were diverted. From this syphon to the Carson River the main canal has a capacity of 1,200 cubic feet.

These thirty-one miles of canal involve many engineering problems more or less novel in their character, but which were successfully solved. Excavations were deep and fills were high across intersecting canyons, where provision of course had to be made for times of flow. Three concrete-lined tunnels, one of them 1,400 feet in length, were constructed at great cost and difficulty, for unforeseen obstacles are always encountered.

Professor Chandler, who has written ably on the subject in the pages of *Sunset Magazine*, states that: "During July, 1904, contracts were let for the construc-

tion of about thirty-seven miles of main distributing canals for the diversion of eighteen cubic feet of water a second from Carson River at a point about four miles west of Lectville, Nev. This work involves about 1,500,000 cubic yards of earthwork besides the concrete diverting dam, the regulating gates, spillways, falls and weirs. The system will distribute water to mains in the Carson Sink Valley and will be supplied by the Lower Carson reservoir."

The Carson River, like Tahoe, has its source in Carson Lake in the high Sierra, and it is to supplement the flow of this more limited stream that the waters of Truckee are diverted from Pyramid Lake to the Carson basin. This great work now supplies water to some 50,000 acres of land and when completed will thoroughly reclaim more than 200,000 acres in Churchill County at a cost of less than \$3,000,000. Altogether the successful carrying out of the Truckee-Carson project means, as stated by Mr. Taylor in *Progressive West*, the addition of from 350,000 to 400,000 acres to the agricultural area of the State of Nevada. This area will be divided into comparatively small farms and under intensive culture, which must of necessity follow irrigation, it will support a very large population. The writer hesitates an estimate of the number of souls it will sustain, but knows he is entirely conservative in placing it at a minimum of 60,000. This, of course, includes, besides the people directly on the land, those

canal from that point to the Carson Sink having been constructed and the water turned in, the attention of the Reclamation Service is now being directed to the



Onion Fields Near Greeley, Colo., on Union Pacific Railway.

construction of the necessary laterals from the main canal penetrating the lands they are to supply and to the storage reservoirs of the Carson River that is to add so much to the water supply. The map shows the location of the lower Carson reservoir, which will have a capacity of over 280,000 acre feet. Three other reservoirs will be constructed in the Carson Basin, adding



Looking West Up Truckee Canal from Top of Tunnel.

in the towns and villages that will spring up in the district. A glance at the neighboring State of Utah, by far more than half of whose nearly half a million population are sustained by less than half a million acres of land cultivated by irrigation, will convince the most skeptical that this estimate is thoroughly on the side of safety."

The diverting dam of the Truckee and the main

250,000 acre feet more. The storage capacity of Lake Tahoe is estimated at 200,000 acre feet and six other reservoirs in the upper Truckee basin will have 90,000 acre feet more. Leaving out the Walker Lake basin an aggregate storage of 820,000 acre feet is provided for over and above the natural summer flow of the streams.

This great work, with its numerous novel features,

has in the opinion of competent engineers thus far been admirably executed, remarkably free from error, and with no suspicion of either extravagance or "graft." It has been and is today an honest, faithful, economical and enduring work of high merit.

It should not be forgotten that this is not a charity on the part of the general Government, but an invaluable help and an inestimable boon to the people and the State, who repay the money expenditure in annual installments. The Government having withdrawn the public lands from ordinary entry fixes a value upon them of \$26.00 per acre, which is not the value of the lands when irrigated, by any means, but is the cost of the water supply. This amount is payable in ten annual installments commencing on the first day of December of the year in which the water shall be

gives the water to the farmer and he reimburses only the expense of making it available. As rapidly as this expenditure is repaid it may be expended upon other irrigation projects.

It is difficult to adequately describe what this means to the settler and to the State of Nevada. It not only reclaims a certain area of land, but makes a new community and reclaims the State to social prosperity. No one can speak of this subject more intelligently than Professor Chandler, who beside his experience in the Reclamation Service is the State engineer of Nevada. He says in *Sunset*:

"The regulation of the streams in addition to building up these many homes will allow excellent facilities for the generation of electric power. Cheap power and a population increased by many tens of thousands should



A Concrete-Lined Curve, Truckee-Carson Canal.

delivered to the lands during the previous April. As explained by Professor Chandler: "The irrigation works will be maintained and operated under the direction of the Secretary of the Interior until all payments are made for the major portion of the lands irrigated. The system will then pass to the owners of the irrigated lands and be maintained at their expense under such organization as may be acceptable to the Secretary of the Interior. The management and operation of the reservoirs and works necessary for their protection and operation must remain under the control of the Government." A widow was the first person to file a claim upon these lands.

Not only is no homestead allowed exceeding 160 acres of land, but that is the maximum allowed to be held by any single individual, and where there be existing ownership of land exceeding that amount the owner is required to sell the surplus in similar tracts to actual settlers. The price of water furnished these lands in private ownership is the same as for the public lands—an annual payment of \$2.60 an acre for ten years. This is an extremely cheap rate; but the Government

justify the introduction of various lines of manufacturing.

"The mineral wealth of Nevada, despite the hundreds of millions that have already been taken out of her mines, is as yet unknown. The remarkable advances in metallurgy have greatly lessened the cost of working ores, so that with the cheap supplies offered by the growth of both agriculture and manufacturing, mines long since closed on account of the expense of operating will become paying properties. The great extension of the irrigated area will make the life of the prospector far easier, and with more territory within the scope of his careful examination new mines will be discovered. In this way new home markets for farm supplies will constantly be springing up until the Nevada irrigator will become independent of the outside world.

"Thus the lonely Sage-brush State will awaken from her slumber to listen to the gladsome shouts of youth in field and orchard, to the clatter of the stamp mill and the roll of ore cars, to the whirl of busy factory machinery, to the unknown sounds of city life.

THE SUPPLEMENTAL VALUE OF IRRIGATION.

DR. JOHN A. WIDTSOE,
Director Department of Agriculture, B. Y. University,
Provo, Utah.

THE TWO PHASES OF IRRIGATION DEVELOPMENT.

There are two distinct phases to the work of reclaiming our desert lands by irrigation. The impounding and distribution of the waters by mighty dams and canals form the first; and the proper and economical use of the water on the farms, the second. The former of necessity precedes the latter, but when the labor expended on the vast irrigated areas, and the possible resulting crops, are stated in dollars and cents, it can not be denied that the proper use of the irrigation water is, financially, superior to the money invested in

crops can not be produced profitably on our western deserts without irrigation. It is only within the last few years that this idea has been shown to rest on unreliable foundation. Rain and snow fell upon the western deserts. Along the edges of the Great Basin, for example, the annual precipitation varies from twelve to eighteen inches, and it seldom falls lower than eight inches at any place in the Basin region. Over a large district surrounding the Navajo Indian Reservation, including portions of Utah, Colorado, New Mexico and Arizona, that ordinarily are looked upon as being hopelessly desert, the rainfall during the last twelve months was a little more than eighteen inches—the average there is perhaps fourteen inches. Over large portions of Wyoming, Idaho and Montana, the annual average precipitation is even higher. More water is needed in arid than in humid regions to produce one pound of



Tunnel Showing Sage Brush Country in Nevada.

the construction of the dams and canals. The accumulated effect of errors in the use of water, in one year, may easily equal a large proportion of the total cost of the works under which the lands lie.

At the present time much is said about the reservoirs and canals to be built; unfortunately, much less is said about the relation of water to soils and crops. The extension of our knowledge of the farmer's side of irrigation should go hand in hand with the engineer's work. If this be not done much loss will inevitably follow.

It is not true that all is known of the proper use of irrigation water that needs be known. The principles of the practice of irrigation are not well developed; many are not at all known; the science of irrigation is yet to be built. This paper is a contribution to the farmer's side of irrigation.

THE VALUE OF THE NATURAL PRECIPITATION.

Especially in the far East, but also among our own western people, the myth has become current that

dry matter. The amount of water represented by an annual precipitation of eight to eighteen inches, if properly conserved, is sufficient to produce profitable crops of many of the useful plants. To illustrate: If 750 pounds of water are required to produce one pound of dry matter, a little less than four-tenths of an acre inch would be sufficient to produce one bushel of wheat per acre. With a precipitation of twelve inches a little more than thirty bushels of wheat per acre should be produced, if all the water that falls soaks into the soil. Naturally, this is far from being true, and the crop producing power of the natural precipitation is correspondingly decreased. Yet, by proper methods of soil treatment one-half to three-fourths of the precipitation should easily be stored in soil and be kept there until required by plants. Demonstrations in Utah and Colorado have shown that it is possible, with proper methods of cultivation to produce as high as thirty-five bushels of wheat every other year with an annual rainfall of about fourteen inches.

Keeping in mind this rather high crop-producing

power of the natural precipitation, it is certainly proper to assert that the first consideration of the irrigation farmer should be the conservation of the rain and snow-fall on his farm. With six to twelve acre inches of water in the soil in the spring the irrigation farmer does not need very much more water to mature any

HOW TO CONSERVE THE NATURAL PRECIPITATION.

To conserve the natural precipitation the western farmers must practice fall plowing, and in the spring the top soil must be carefully stirred and smoothed to prevent the evaporation of soil water. Moreover, since land is plentiful and water is scarce, it would be well



Opening Flood Gate of Truckee Irrigation Canal in Nevada June 17, 1905.

ordinary crop. On such a soil irrigation should be applied only at the critical periods in mid- and late summer. In short, irrigation should be supplemental only to the natural precipitation. Where the rainfall is high the duty of water should be correspondingly high; where it is low, the duty of water should likewise be low.

The failure to appreciate this principle has led to

to let a portion of land lie fallow every year, for the purpose of gathering two years' precipitation for the use of one crop. Were the annual crops of the West planted on fall plowed fallow soils, there would be general need of irrigation water only at the late critical periods. The arguments against fallowing, urged in the East, do not hold in the West. In the East soils are fallowed for fertility; in the West for water.



An Irrigated Wheat Field in Dawson County, Neb., on Union Pacific Railway.

much disaster on the irrigated farms. In the interest of economical, rational irrigation, every farmer should be taught that the irrigation stream is only supplemental to rain and snowfall.

FALL AND SPRING IRRIGATION.

The best water reservoir yet found is a deep, uniform soil, such as occurs over a large portion of the West. In many places much of the fall water goes to

waste. It should always be stored in soils that are to be cropped the following year. The early spring waters should, likewise, be run on the land and made to do duty in producing crops. As before remarked, soils well stocked with water in the spring usually are able to carry crops through the season without much irrigation; the irrigation of such fields is valuable chiefly in increasing the yield, and making the plant safe during the critical heated periods.

It does not matter so much when the water enters the soil. The chief thing is to get sufficient moisture into it. If the wasted waters of fall and spring were used on the fields, the duty of the irrigation stream would again be materially increased.

to May 4th the total precipitation was in fact 11.5 inches. A little more than 82.6 per cent of the total precipitation was thus shown to have entered the soil, and to be stored there at the beginning of the active growing season.

Such observations have been made on other soils, with practically identical results. Of course, in every case, where such results have been obtained, the soils were plowed in the fall and carefully harrowed in early spring. Similar soils plowed in the spring seldom gathered more than one-third of the natural precipitation.

The land above described, was planted to wheat in the spring, and varying amounts of water were ap-



Diverting the Truckee River Into the Flume, Truckee-Carson Project.

It is a crime against the interests of the arid West to let either fall or spring water run to waste.

AN EXPERIMENT ON THE VALUE OF THE NATURAL PRECIPITATION.

On a typical great basin soil, classed as a medium loam, observations have been made for the purpose of determining how much of the natural precipitation may be retained in the soil. In the fall, about the middle of August, after the wheat harvest, the soil was found to contain 9 per cent of moisture to a depth of eight feet. It is an interesting fact that, on similar soils, it appears that wheat can not reduce the soil moisture below 9 per cent. On May 4th of the following spring the soil was again examined and found to contain an average of 17 per cent of water to a depth of eight feet. Seventeen per cent of water is nearly equivalent to 20 acre inches of water. Deduct from this depth 10.5 acre inches, the equivalent of the water found in the soil in the fall, and there remain 9.5 inches, which must have been added to the soil as rain and snow. During the period from August 15th

plied to the different plots into which the field had been divided. The results follow:

Depth of Irrigation Water Applied During Season. (Acre Inches.)	Depth of Irrigation Water Applied, plus the Moisture Stored During the Fall and Winter. (Acre Inches.)	Yield of Bushels of Wheat per Acre.
2.5	12.0	35
5.0	14.5	38
7.5	17.0	39
10.0	19.5	42
15.0	24.5	47
54.0	63.5	43

Even a glance at this table shows that the water stored in the spring must have been active in producing the crop. The first 2.5 inches applied produced thirty-five bushels, while the next five inches produced only four bushels more. If the irrigation is considered as alone having value in crop production, the above table would give the first 2.5 inches a value of fourteen bushels per inch, while the following five inches would have an inch value of only .8 bushel. Such a

tremendous difference within such narrow limits seems unreasonable.

If, however, moisture stored in the soil above the limit to which wheat can exhaust soil, be taken into consideration, the value per inch of the first 2.5 inches of irrigation, plus the soil moisture, was a little less than three bushels, while the corresponding inch value when five more inches of irrigation water were added, was about 2.3 bushels. Such a gradual decrease is, of course, more reasonable.

As more irrigation water is added, the bushel yield per inch steadily decreases, thus showing that, inch for inch, the water stored in the soil in the spring is of higher crop producing value than any irrigation water applied. Certainly, in considering the effect of any depth of irrigation upon crop production, the

optimum amonsit in this paper, but simply to call attention to the fact that in the case of all annual crops, the supply of moisture must be most available from early youth to the time of flowering. Especially does the demand rise just before and during early flowering time. When the flowers are once well produced, the crop needs much less water for its life processes, and then the soil moisture may be allowed to fall. If this be so, we have another argument in favor of the largest possible amount of capillary water in the soil in early spring. Thus, also, the supplementary nature of irrigation is emphasized.

CONCLUSION.

The limits of this paper do not permit the development of this subject. The barest notice must suffice



An Irrigation Scene on Union Pacific Railway—In the South Platte Valley.

amount of moisture in the soil must always be taken into consideration.

ANOTHER VALUE OF EARLY SOIL MOISTURE.

Plants do not possess the power of regulating the amount of moisture that may be taken from the soil. From a moist soil much more water is taken per day or week than from a drier soil. If the soil is kept very dry, much of the energy of the plant is lost in overcoming the attraction between the soil particles and the thin water film. If the soil is kept very moist, much of the energy is consumed in evaporating immense quantities of water into the air. In either of the above cases, the lost energy means a reduction in the yield of dry matter per acre. It should be the aim of the wise irrigator to keep the soil supplied with the best amount of water at all times, that is, the proportion of soil moisture that will furnish the amount necessary for thrifty plant growth in the most economical manner. It is not the purpose to discuss this

at this time. All plants are like wheat in the manner in which they appreciate the start given them by an abundance of moisture, stored in the soil in early spring. When it shall be understood by irrigator and canal manager, that over a large portion of the irrigated area, irrigation should be supplemental to the natural precipitation, very little irrigation will be given wheat and the other grains, and correspondingly less water will be given sugar beets, potatoes and other longer growing crops. As a consequence, the water at the disposal of the farmer, will be made to cover more acres; more crops will be obtained per acre inch of water, and the wealth of the irrigated area will be increased.

We are yet in the beginning of irrigation knowledge. There is a vast undiscovered field covering the relation of crops and soils to water under the climatic conditions of the Western United States. The supplemental value of irrigation will not be the least important branch of that coming study.

WESTERN NEBRASKA.

G. L. SHUMWAY.

THE IRRIGATION AGE has indexed to the land hungering world many localities of promise, and inspired by the belief that the sun-land of western Nebraska is possessed of charms individual to its location and physical features, a brief sketch of its past, present and future will be of interest.

The particular portion described will be the North



Wheat Field in Western Nebraska, near Scottsbluff.

Platte Valley, just now a special object of interest because of the Harriman-Hill antagonism which is contesting for its territory. Indications point out that probably, ultimately, two trunk lines will traverse the fertile portion of this valley.

Six years ago settlers traveled forty or fifty miles to the nearest railroad. Unimportant villages were here and there located on star routes. The acreage irrigated was small and no market except the home. Today over 100,000 acres are under irrigation; and this year's product is an unexpected surprise to the Burlington, which is now the only railroad. For the last several weeks an average of four freight trains a day each way has found much difficulty in handling the traffic on the ninety-five miles between Guernsey and Bridgeport.

In the heart of this section stands Scottsbluff, the metropolis of the valley, five years old and 1,200 people. It contains a high school erected at a cost of \$10,000, having eleven grades and 300 scholars. The village has no saloons and has four churches, the largest of which cost \$5,000.

Gering, the old town and county seat, is two and a half miles distant. It has about 800 inhabitants. The population of the valley is approximately 7,000.

Up to date the most profitable crops grown have been oats, yielding fifty to 140 bushels to the acre. wheat, twenty to forty-five bushels; potatoes, 150 to 400 bushels; alfalfa, three cuttings or six tons per year; and wheat grass hay. The year 1905 was the first experiment with sugar beets; 2,000 acres were planted, yielding from fifteen to thirty tons per acre, at \$5.00, on track. The two best fields made a gross product of \$140.00 and \$150.00 per acre with an expense of about \$30.00 per acre. Tests have shown exceeding richness.

Heyward G. Leavitt, president of the Tri-State Land Company, is operating here on a large scale. His company is at work constructing a canal 100 miles long, forty feet wide at bottom, and twelve feet deep. It owns about 40,000 acres of splendid land, and associates have also controlling interests in another canal covering some 10,000 acres. This company, or another, with which Mr. Leavitt is associated, will put in a million-dollar sugar factory in the near future.

The United States Reclamation Service is doing a vast amount of work in this vicinity. The North Platte project finds its greatest acreage in Nebraska near here. The Pathfinder Dam, near Alcova, Wyo., will cost a half million dollars, and will conserve the entire flood waters of the North Platte and Sweet Water Rivers. Its capacity is sufficient to irrigate all available areas, which is about 300,000 acres, and water to spare. Canal construction is in progress; contracts have been let for forty-six miles, May 8th, and fifty-five miles November 8th, at a total approximate cost of one million dollars. The first portion will furnish water for 1906 and the second for 1907. Probably 150 miles more of main canal will be constructed in the next few years. When completed this will be the largest contiguous irrigated area in the world, and will support 100,000 population. Future productive capacities are enormous to contemplate.

Lands now furnishing only scant pasturage will, by the magic touch of water, intensified farming, and fruit culture, produce millions of dollars in value annually. The locality is well adapted to fruit, especially berries, cherries and plums, which begin bearing very



Potato Field, Western Nebraska, Near Scottsbluff.

young, and are prolific, and the fruit is of exquisite flavor.

PAYS ADVERTISERS.

In order that our readers may understand more about the benefit to be derived from advertising in the columns of the IRRIGATION AGE, we quote the following paragraph from a letter recently received from Mr. C. D. Butchard, manufacturer of the Northwestern head gates, Denver, Colo.:

"You will doubtless be pleased to hear that the small space I am using in the IRRIGATION AGE is producing excellent results."

A suggestion to the wise is sufficient.

CANADIAN IRRIGATION.

BY J. M. P.

Co-incident with the marvelous strides in irrigation development in the United States our Canadian friends have been developing irrigation projects in Western Canada of no small proportions. In the province of Alberta, one of the new provinces of Western Canada, there has been more or less irrigation for the last eight or ten years.

The results have been uniformly satisfactory. While Alberta is not an arid or even a semi-arid country, yet the average rainfall is comparatively small. It has long been a settled conviction in the minds of the officials of the Canadian Pacific Railway that wherever irrigation could be introduced in Western Canada, and especially in Alberta, it would not only be a wise thing to do, but most profitable. Our Canadian friends

American continent. The area eventually to be placed "under ditch" is a million and a half acres. This tract has been divided into three sections, and a part of the first or western section of these canals has been completed during the summer and fall of this year, 1905. The main canal in this system is sixteen miles long, fifty-four feet wide at the bottom, eighty-five feet wide at the water line, and carries ten feet of water. Something like 100 miles of secondary canals has already been constructed, and about 100,000 acres of this tract are to be brought under water in the spring of 1906.

The water for this irrigation is taken from the Bow River at the city of Calgary. The Bow is a noble stream flowing out of the Rocky Mountains, eighty miles west of Calgary. By the government gauges it is learned that at low water mark there is sufficient water in this river to irrigate twice the acreage the Canadian Pacific Railway proposes to place "under



Lateral of Canadian Pacific Colonization Company's Canal Near Calgary, Alberta, Canada.

believe, as we Americans are coming to believe, that irrigation is profitable wherever possible.

Our Canadian friends, however, are conservative and have moved in the matter of irrigation, as in other matters, with the greatest caution. Several years ago the Canadian Pacific Railway set about a thorough investigation of a large tract of their lands lying east of Calgary with a view to putting it "under ditch." Among other experts who were invited to look over the proposition was that greatest of all American experts, Dr. Elwood Mead. The unanimous verdict of these irrigation experts was that here was a tract of land that was most admirably and peculiarly adapted, both as to soil and climate, to the purpose of irrigation. The same experts have pronounced the Canadian water right law as unequaled in America.

After taking these preliminary precautions the Canadian Pacific Railway Company set about to build a system of main and secondary canals which would bring "under ditch" a tract of land, which, considered from the point of acreage to be irrigated, is doubtless the largest single irrigation undertaking on the

ditch." The Canadian irrigation law, not a Provincial but a Dominion law, or, as we would call it in the States, a Federal law, fixes the "duty of water." Any company undertaking to irrigate a district must supply water according to the rule laid down by the irrigation law of Canada. It is claimed with pride by our Canadian friends that there has never been any litigation over water rights in Canada. As the law is framed and administered it is difficult to see how it is possible that there ever should be any litigation along these lines.

While the railroad companies in the United States have done much to promote irrigation in order to settle the country adjacent to their various roads, yet it is not within the knowledge of the writer that any of these roads has ever undertaken with its own funds, and as a part of its corporate activities, to construct and maintain an irrigation system. The Canadian Pacific Railway is unique in this matter as it has not only constructed this irrigation system at an expense of millions of dollars, but it guarantees the water to the settler according to the "duty of water" as prescribed

by the Canadian irrigation law, but also guarantees forever to maintain the system of canals and to deliver water to each quarter section of land brought "under ditch."

This particular section of Western Canada has, within the past few years, attracted almost world wide attention by its tremendous yields of the smaller grains, especially winter wheat. By the introduction of irrigation these great yields of wheat and other small grains will be assured every year and in addition thereto the raising of alfalfa and sugar beets will be rendered not only possible but most profitable.

Alberta has been, and is, a great stock raising country. The native grasses on these prairies are probably unequaled anywhere else. So much is this true that Alberta has been appropriately called the "Sirloin of Canada." With the introduction of alfalfa it is known that the raising of stock will become still more extensive and more profitable. Sugar beets have been raised and there is already a beet-sugar factory in Southern Alberta. The long days of sunshine common to

The climate of Alberta is also an attractive feature. Many people think because it is far north and far west it must be as cold, or even colder, than Manitoba, which is known to be a rather cold country. The fact is that Alberta comes under the influence of the Chinook winds from the Pacific, and the climate of Alberta is more to be compared with the climate of Colorado or certain parts of Montana than it is to be compared with that of Manitoba. For a northern clime it probably has no superior on the continent.

The vastness of this undertaking and the favorable conditions as to climate and soil and water, together with the fact that the great corporation, the Canadian Pacific Railway, is forever to maintain the system, has attracted the attention of experts in agriculture the world over. It is predicted by our American irrigation experts that there will be a vast tide of emigration from the irrigated and non-irrigated States of the Union into the territory acquired by this new project. The tide of emigration from the States to Western Canada has been increasing for the past five years at



Section of Main Canal, Canadian Pacific Colonization Company's Project, Calgary, Alberta, Canada.

this north country have proven peculiarly suitable to the raising of sugar beets. The soil is rich and a large tonnage is always secured in sugar beets, and the percentage of pure sugar averages higher than in the United States. It is believed that Alberta along the line of this vast irrigation project, will become a great producer of beet sugar.

It will be of interest to our readers to know that in this great irrigation undertaking there is not a single tunnel or flume. Nature seems to have perfectly adapted the contour of this section of land to the artificial application of water. Partly because the cost per acre of getting the water upon the land is comparatively small, although the aggregate cost of this tract is great, and partly because the Canadian Pacific Railway was more desirous of building up a great agricultural community than of making an immense profit by the sale of the land, these lands are to be placed upon the market with a perpetual water right at a merely nominal price as compared with the prices of irrigated lands in the States, and the maintenance charge is to be less than that attached to any irrigation projected conducted by a corporation in the States.

a marvelous rate. The American farmers in Western Canada have been so uniformly, and in many cases, so marvelously, successful that the desire to possess some of this Canadian land has become almost a craze in the Western States, and while the price of lands in Western Canada has advanced rapidly within the past few years, the opportunities for profitable investment are just as great today as ever, and while it is not our business to advocate the advantages of a foreign country over and above those of our own country, yet it is our business and privilege, wherever the facts are so apparent as they are in the case of Western Canada, and especially in Alberta, to call the attention of our American friends and patrons to the superior advantages offered across the border. We do not and can not forget that for years the young blood and the vigorous blood of Canada has been pouring into the United States, and now that the door of opportunity has opened wide in Western Canada, we feel as a matter of even-handed justice that we are only in part repaying our Canadian friends a just debt and sending back to them a part of that which belongs to them.

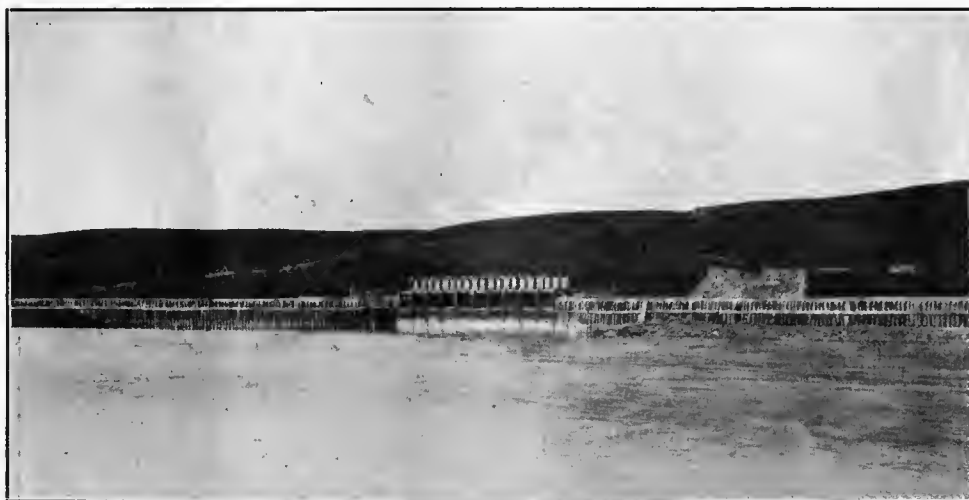
RECLAMATION NOTES.

A resumé of the work performed by the Reclamation Service to date shows that seventy-seven miles of main canal, fifty-four miles of distributing system and 186 miles of ditches have been constructed, including dams, headworks, etc. Tunnels, having a total length of three and one-half miles, have been driven, including more than a mile of the great Gunnison tunnel. More than 250 miles of telephone lines have been installed and are in operation; 126 miles of wagon road, many miles of which were cut out of solid rock in almost inaccessible canyons, 147 bridges and fifty office and other buildings have been constructed.

The works above mentioned have called for the excavation of 9,350,000 cubic yards of rock and earth, the laying of 70,000 cubic yards of concrete, 12,000 cubic yards of rip rap, 190,000 square feet of paving, 150,000 linear feet of sheet piling and 10,000 feet of bearing piles have been driven. There have been purchased 130,000 pounds of railroad iron, 250,000 pounds

GRAFT AND WATER

The natural irrigation fund has several fingers of graft mixed up inside of it and Oregon and Washington projects in consequence are held up pending the elimination of the pap tubes through which the leakage is running. It is refreshing to know that the graft has been discovered before the many millions of the fund disappeared entirely, and it is further a source of no little gratification to feel that perhaps the great great grandchildren of the present generation may possibly receive a little benefit from the fund if it holds out that long. With the graft and red tape of government irrigation projects eliminated, something might be done, but it begins to look as if there would be mighty few rose tinted skies to beam on those who, in the midst of immense desert regions, fertility undisputed, are watching and waiting for Uncle Sam's jack pot of many millions to be amicably divided among the long fingers at present dabbling with it.—*Journal, Pineville, Ore.*



Bow River and Intake of Canadian Pacific Colonization Company's Canal near Calgary, Canada.

of structural steel, 600,000 pounds of cast iron, 1,750,000 feet B. M. of lumber, and 78,000 barrels of cement. The Government has erected a cement mill at a cost more than \$100,000, which has already turned out 15,000 barrels of cement, and is now furnishing about 300 barrels a day. The saw mills operated by Uncle Sam have cut 2,880,000 feet, B. M., of lumber from the Government reserves.

The United States Reclamation Service was organized in 1902, immediately after the passage of the Reclamation Act. As soon as possible after a discussion of preliminary plans in Washington, investigations were begun in the thirteen States and three territories which are beneficiaries under this act. By utilizing the data gathered in previous years by the hydrographic branch of the Geological Survey, the service was enabled to concentrate its efforts upon several projects and plans for their construction were soon prepared for the consideration of the secretary of the Interior. Up to the present time eleven of these projects have been approved and are under actual construction. Their estimated cost is nearly \$30,000,000.

AN IMPROVEMENT.

Years ago water gates made of rough boards were considered all that was necessary, but with the settlement of the West the need arose for an inexpensive, durable and water-tight headgate—one that would enable a farmer to exactly regulate and economize his water supply. The headgates made by C. D. Butchart, of Denver, Colo., were designed to supply this need. These headgates—the Northwestern—are made entirely of iron and steel, and for connecting to vitrified, clay tile or to iron pipe. A glance at Mr. Butchart's catalogue will show you that Northwestern headgates are simplicity itself, so that they can not get out of order, and considering their great durability and other advantages their cost is very low.

Will pay for the IRRIGATION AGE
\$2.50 one year and the PRIMER OF
IRRIGATION.

BILLINGS, MONTANA.

BY W. T. CLARK.

(Read before the Commercial Club of Billings.)

For the benefit of our friends throughout the country, I have been asked to prepare a paper on what we have done at Billings during the past year and how it was done.

Billings, as a good many of you know, has done a great work during the last twelve months. She has become known not only to her own citizens and to the people of Montana, but her fame has gone to the East and to the West, reaching localities where even the name of Montana was hardly known. In the minds of the people of the East whom we have gone amongst to spread the gospel of Billings and the Yellowstone Valley, Montana, during at least half the year, is a frozen

However, this is not telling you what Billings has done, or, rather, what has come to Billings by reason of the efforts of the people of Billings. Being the manager of the Billings Land & Irrigation Company, it is perfectly natural for me to put that company and its work first among the good things that have come to Billings. As a matter of fact, it was the first good thing to come to Billings for many a year and following in its wake came next a creamery capable of working up the milk of a thousand cows, and next along the line of agriculture a beet sugar factory capable of slicing a thousand tons of beets every twenty-four hours and costing a million dollars. Other things have followed but these three things are by far the greatest.

Now, the question, I presume, that our visitors are interested in is, How was it done? The most of them know that we have these things, that Billings has become known far and wide and is recognized today as



Stacking Alfalfa Near Billings, Mont.

zone and the occupation of the people consists entirely of mining, stock raising and taking an occasional shot at each other.

Now, as a matter of fact, Montana has little more, if any, colder weather than the great agricultural states of the Middle West, the climate of the Yellowstone Valley in particular excelling any portion of the great Mississippi Valley; her agricultural possibilities, especially where water can be put on the land, greater than any portion of the Mississippi Valley.

The problem for us was to make them believe what we had to say in regard to the Yellowstone Valley and Montana and to make them believe the evidence of their own eyes when shown the exhibits of grains and vegetables. In the language of the cowboy, so well known in Montana, we had to corral them, lasso them and brand them; in other words, by furnishing them free transportation and bringing them out and showing them the country we induced a number to locate with us. As this process was continued it became easier until now we have a large number stopping here without solicitation.

one of the brightest cities in all Montana, and they want to know how they can go ahead and do likewise.

The answer is very simple. Find out what you want in your numerous localities, then put your shoulder to the wheel and push and keep pushing, and then push again, and you have my word for it, good results will follow.

Coming back to the first good thing: After it was decided it was a good thing for us to put this canal in and all arrangements made to finance and construct it, it was found necessary to obtain a great deal larger price for lands than had prevailed heretofore in this country or the enterprise could not be made a financial success. The problem of selling raw lands in a country where partly improved lands under old and tried canals were selling for less money than the new lands could possibly be sold for, was a hard one. It called for something extraordinary and out of the regular line of an irrigation company's work. It called for the lifting of values over the entire district tributary to this system.

Much money had been spent in advertising Billings

and the Yellowstone Valley with only moderate success. One of the irrigation company's agents, having drifted into Colorado in his efforts to induce settlers to come here, saw the effects of the beet sugar factories on land values and one the people themselves and wrote us about it. This country, being capable of producing all of the products of the temperate zone, including sugar beets, the idea suggested itself that a beet sugar factory would very likely bring about the desired results. Sugar beets having been grown here for a series of years, principally through the efforts of United States Senator W. A. Clark, sufficient evidence to satisfy beet sugar men was easily procurable, but the problem of inducing outside capital to the extent of a million dollars to come to Billings confronted us.

This was put before the Commercial Club as was also the other fact mentioned, that is, until better prices could be secured our country must practically remain at a standstill. The response was immediate and strong and it was decided to make every effort to secure the sugar factory and to that end a subscription paper was immediately started for the purpose of securing the funds for the promotion of the work. Inside of forty-eight hours \$10,000 was subscribed for that purpose.

Correspondence had for some time been passing between a successful promoter of sugar factories in Colorado with the result that he was on the ground at the time our decision was made and engaged to work at once for Billings along those lines. The committee appointed by the Commercial Club to handle this work went at it with enthusiasm and was ready at all times to stand back of the efforts of our agent. How successful this effort has been you all know.

The news having gone abroad that Billings was doing things and had raised this large sum of money for promotion purposes, had evidently created the impression that we had money to burn. At any rate about this time a creamery man appeared upon the scene with a proposition to put in a creamery. This proposition was met and accepted with the same promptness and enthusiasm displayed in the work of securing the beet sugar factory, and within fifteen days subscriptions from farmers and business men to the amount of \$6,000 had been obtained and the machinery for the creamery ordered. It is now in successful working order and having no trouble in disposing of all the butter it can produce and is having a splendid effect in inducing farmers to purchase milch cows. In a short time we anticipate the milk business will become one of the greatest of our agricultural resources.

The members of the Commercial Committee having this work in hand had by this time acquired the habit of doing things, and, better still, of seeking something to do for the good of the Valley.

It was called to the attention of the Commercial Committee that the Government proposed building innumerable works in and around Billings, that the headquarters of the Reclamation Service for the Northwest was at Denver; also that the great work the Government was undertaking at Big Horn basin and at Glendive and on the Crow Reservation was more directly tributary to Billings than to Denver, the idea of making Billings the headquarters of the Reclamation Service was presented and immediately followed by prompt action. We not only took the matter up with the Reclamation Service Department itself, but wrote our Congress-

man, Joseph M. Dixon, soliciting his aid; also to the heads of the Northern Pacific and the Burlington Railways, all of whom very promptly and kindly put themselves on record in favor of Billings. The result: Billings is the northwestern headquarters of the Reclamation Service and has already received immense benefits from its location.

Attention having been called to the Government work, different ideas rapidly presented themselves, amongst which was the subject of the area of a Government homestead under irrigation. Our contention being that eighty acres was sufficient, correspondence immediately followed and I am glad to say that the Government had adopted the eighty-acre basis on the Crow Reservation instead of the 160 basis, thus doubling the population tributary to Billings. In this work we also asked the railroads to assist, which they did gladly. Right here I wish to say the railroads are the greatest factors in the upbuilding of any district. Good transportation is absolutely essential to good results in farming, manufacturing or any other business, and, on the other hand, the success of the railroads depends upon the successful cultivation of the soil and the successful carrying on of every other line of business. We should, therefore, feel free to ask of the railroads their full co-operation in any scheme for the benefit of the State in the way of settlement.

This is practically the sum total of the achievements of the city of Billings and the Billings people during the last twelve months.

Having done so much, the question naturally arises, Has it paid? Dollars and cents being the basis upon which all things earthly seem to rest, we will venture this statement, that the increase of values in this city and in the country immediately tributary to it has been not less than two millions of dollars in the last twelve months. Nor is this the only benefit. The material welfare of the people has been greatly increased, each and every man in Billings feels the effect. We are all boosters and all sanguine of the success of our city and country. We have been born again and we believe that we are in the possession of the finest agricultural valley the sun shines on.

We had by this time hit a pretty good pace; from all directions were coming people with schemes of all kinds, evidently having heard that Billings was easy. It caused us to take a recast of what had been done and the cost of doing it and we were all but dismayed to find the large amount of money that we had actually parted with. However, this did not determine us to stop and rest or to quit paying out, but it did cause us to look about for proper means of economizing our expenditures. The different real estate and land firms in the towns were doing lots of advertising; business houses were doing considerable, and in the aggregate a large sum of money was being spent, apparently with little result.

This suggested another idea; you will note that Billings is full of ideas, and am glad to see that the Billings idea has taken effect—our new idea was a centralization of all our expenditures into one man's hands or into a bureau organized for that purpose. Here was born the Boosters' Club, and because of the Boosters' Club you are all here today to grasp the Billings idea.

I have not been asked to say anything about the duties of this convention or to suggest any line of

action. I have been asked merely to tell what we of Billings have done. So I will pass that for the convention to discuss and to determine. We want to say of Billings that she has only begun; that in casting a horoscope of her future, we see a motor system spreading out in all directions with Billings as a center. The coming of the beet sugar factory will cause a dividing up of the great holdings of the cattle and the sheep men so that in a few years the average holdings in this valley will not exceed forty acres. With a family on every forty acres the motor system will be successful, and I want to say right here that we will have it. With the advent of the motor line land values will rise in every direction. It will give us courage for new ventures and new possibilities will arise until in the years to come we expect to see the hills surrounding this beautiful valley dotted with homes. Nor is this all. The people of this great valley with consequent increase of values, will bring about a development of the other resources necessary to supply the growing population with their daily needs. New coal mines will be opened; the immense water power now running to waste will be developed, the clays and shales will be turned into brick and stucco work and more than likely the manufacturing of many different things we do not now know of, will take place.

One more reference to Billings and its resources and I will be done. Not many of you know that there is tributary to Billings over one million acres of land susceptible to irrigation and that at the present rate of going this immense area will be supplied with water and ready for the settler within ten years. What this means for Billings I will leave you to decide.

Now then, what is true of Billings, is true of any other district in this State. We have no monopoly of the good things of Mother Earth; in fact, I know other districts in this State claim that they are better. Be that as it may, I only know this, it will take push and energy and lots of it and lots of study and then some money to put your claims before the people and so surely as you do so the results will be more than satisfactory. Being a land man I naturally suggest to you to look to the lands. I believe one farmer is of more value to the State of Montana than two men of any other occupation. If we will put forth our efforts toward the settlement of the lands, in a few years the agricultural wealth of Montana will far exceed all others and as to the welfare of the people there will be no comparison.

One of the objects of this meeting, I believe, is to consider plans whereby we can get the farmer. We want him, the railroads want him, and in his wake all other things follow.

NOTES ABOUT BILLINGS.

Among the many prosperous citizens of Billings, Mont., is Mr. W. F. Snyder, who moved from Midland County, Michigan.

During Mr. Snyder's early career he was a struggling farm hand in Michigan, subsequently buying a forty-acre woodland tract. He worked in the lumber woods of his native State during the winter and worked at clearing his land and farming during the summer months. He had started with nothing, consequently had nothing to lose and it took the better part of two years' hard labor on the part of himself and wife to get their "forty" in shape to do anything. They had accu-

mulated during that time not only a fine girl baby, but a cow, one brood sow and eleven bushels of wheat as well. The above was all that their place in Michigan would do for them with the addition of a moderate living during that time. At the end of about twenty years' hard work in Michigan Mr. Snyder had secured title to 160 acres of land on which was a mortgage of \$600. About this time he decided to visit Montana, where relatives had preceded him, and spent the winter of 1893-4 in that State near Billings. He subsequently returned to Michigan, but was dissatisfied there after having investigated the opportunities of Montana, and later on took up his permanent residence in the latter State. He worked for a time for I. D. O'Donnell, the well-known ranchman, who was one of the pioneers of the Billings country. Mr. Snyder first worked as a farm hand and later became foreman for Mr. O'Donnell.

In 1900 Mr. Snyder purchased 160 acres on credit. He subsequently sold his Michigan holdings, on which he secured \$1,000 clear and with that amount, as part payment, purchased an additional 240 acres partly improved.

He continued to prosper, erected farm buildings, and the land meanwhile rapidly increased in value; in other words the money earned from the land was expended in improvements until it finally reached the value of and sold for \$14,000.

Mr. Snyder is now at work improving his original purchase of 160 acres and is at present living comfortably in the city of Billings.

His family have, meanwhile, received all the benefits of a good school system and he may be classed as one of the prosperous citizens of that community.

The above facts are given so that those in the Central States who may contemplate moving to Montana, may know what can be accomplished by a man who has small means and is willing to work. Mr. Snyder is probably worth \$25,000 today.

A CHEAP FARM LEVEL.

We could scarcely have gotten along this season in opening up a large ranch to irrigation cultivation without the use of a farm level, the cost of which is \$10, but which we are satisfied has saved us hundreds of dollars through the additional land brought under ditch by it.

In one instance we found by running some preliminary levels that we were enabled to bring fifteen acres of fine bench land under water which we supposed by cursory glance of the eye was so far above the water grade as to remain forever high and dry. This patch is now in full bloom with a good crop of spuds coming on and we consider ourselves just that much ahead of the game. Quite a number of these instruments have been sold in Colorado this year and others will be wanted when their merits are better known. They are manufactured by the Bostrom-Brady Company, of Atlanta, Ga., a perfectly reliable concern, which will express a farm level upon receipt of \$10.—*Field and Farm.*

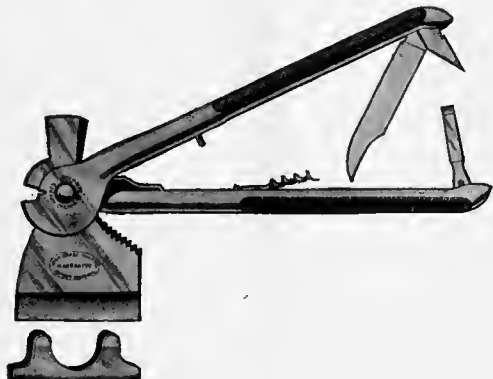
Send \$2.50 for The Irrigation Age
1 year, and the Primer of Irrigation

AN ATTRACTIVE GIFT.

We are showing herewith an all around tool which would be serviceable in any household. By examination of the illustration it will be seen that this tool discloses twelve different combinations as follows:

Hatchet, hammer, wire cutter, wire splicer, pinchers, alligator wrench, leather punch, corkscrew, nail claw, hunter's knife, can opener and screwdriver; all of which are convenient and practical tools ever ready at hand for immediate use in any emergency, in which event they are especially valuable.

This aggregation of twelve different tools as shown in illustration, if bought separately in any retail hard-



ware store would cost in the neighborhood of \$7.00. We will be glad to furnish these tools to any of our readers for \$3.50 charges prepaid, or we will send one of these tools, charges prepaid, to our readers sending us a club of ten new subscribers to the IRRIGATION AGE at \$1.00. It will be seen that by securing ten subscriptions to the IRRIGATION AGE and remitting same to us that you may secure a combination of twelve tools which could not be purchased for less than six or seven dollars.

We will guarantee this tool to be of best workmanship and will replace any that show defects.

ASHLAND COUNTY THE MANUFACTURING CENTER OF THE UNITED STATES.

The United States now stands at the head of the nations of the world in manufacturing. The center of population as well as the center of manufacturing activity have been gradually creeping westward ever since the Colonies declared their independence and separated from the mother country.

Ashland County now enjoys the unique distinction of being the center of manufacturing activity in the United States. Mr. F. E. Myers' attention was called to this last week in Chicago by the secretary of the National Association of Exporters who informed Mr. Myers that the United States Census, Department of Manufactures, volume I, page 171, locates the center of manufacturing activity three miles southeast of Loudonville, Hanover Township, Ashland County, Ohio.

In 1850 the center was near Mifflintown, Pa. In 1860 near Indiana, Pa.; in 1870 near Kittanning, Pa.; in 1880 near Butler, Pa., and in 1890 near Canton, Ohio. The census of 1900 places the center of manufacturing activity in Ashland County as above referred to.

POCKET KNIFE TOOL KIT FREE.

We are showing herewith the "Napanoch" pocket knife tool kit, the latest thing in a serviceable novelty which we have been able to secure, and it will be noted may be firmly attached to the pocket knife as indicated by arrow in one second by a simple backward wrist movement and is quickly removed by a forward wrist movement. This tool kit is more useful than any other pocket knife combination ever made. It is made by skilled workmen and of the best material and is sold with an unlimited warrantee.

The cut shows:

No. 1—A fine leather pocketbook, $4\frac{1}{2}$ inches long by $3\frac{3}{4}$ inches wide, $\frac{3}{4}$ inch thick, containing all



of the tools illustrated, making a convenient case easily carried in the pocket.

No. 2—Pocket knife, length $3\frac{7}{8}$ inches.

No. 3—Reamer, length $3\frac{1}{8}$ inches.

No. 4—File, 4 inches.

No. 5—Saw, 4 inches.

No. 6—Chisel, $3\frac{5}{8}$ inches.

No. 7—Screw driver, $3\frac{3}{4}$ inches.

This is a very serviceable tool for a boy or young man and is a handy tool about the house and can be handled by any one. The selling price of this tool is \$2.25 each, but in order to give the young members of the family of the readers of the IRRIGATION AGE an opportunity to secure this without cost to them we offer it for six new subscribers to THE AGE. This tool will be sent to any one free of charge, postage prepaid, who will send us in six subscriptions at \$1.00 each.

THE IRRIGATION AGE, 1 year	\$1.00
THE PRIMER OF IRRIGATION, a finely illustrated 300-page book.	2.00
If both are ordered send	2.50
Address, IRRIGATION AGE, 112 Dearborn Street, Chicago.	

THE U. S. RECLAMATION DEPARTMENT MUST ANSWER THIS QUESTION.

BURLEY (IDAHO) BULLETIN.

The citizen locators on the south side of Snake River, in the Minidoka reclamation project, Cassia County, Idaho, are praying for an answer to a very civil question. In the name of humanity, this is a righteous one and demands an answer, and soon:

When will the settlers on the south side receive water? This question is asked in a respectful and courteous manner. If the Reclamation Service does not answer, it is unfair and brutal treatment of 500 American citizens who with their wives and babies are doing time on arid homesteads, hoping against hope. Are they not entitled to an answer to this question, which is bread and butter to them? If some of these government officials who are living on the fat of the land had to spend a month on one of these arid ranches, and be kept on the rack as to when water would be given them, and when they wanted a drink of water had to go miles for it, their howls would make a coyote ashamed of himself. The Boise-Payette project is hanging fire, condemnation proceedings are talked of. In the writer's opinion this is a bluff. The Reclamation Department will be chary of such procedure. If matters are not shaped up right by the time Congress convenes there will be stunts doing. What is the matter with returning to the Minidoka project the \$1,300,000 diverted from said project and carrying out the original Minidoka project in its entirety and do business, while the Reclamation Department and the citizens of the Payette-Boise project are scrapping?

Was it not the intent of the Government Reclamation Act to reclaim desert government lands and not desert lands in private ownership? If the Reclamation Department does not intend to reclaim the lands on the south side of the Minidoka project within a reasonable time; if it will surrender the south side and give a strong company the right to construct the south side system, giving said company the water located by the Reclamation Department, this company will pay its proportion of all expenses and do business on its own account.

In plain words, if the reclamation department does not intend hatching all the eggs in the Minidoka project's nest, if it will abandon the south side eggs a new nest will be built and a new hen go on. The Reclamation Service is again requested to answer the question: *When will the settlers on the south side receive water?*

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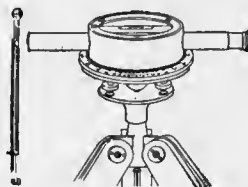
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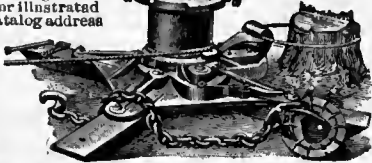
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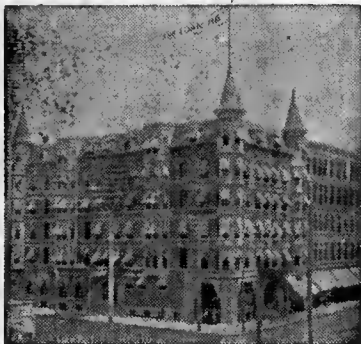
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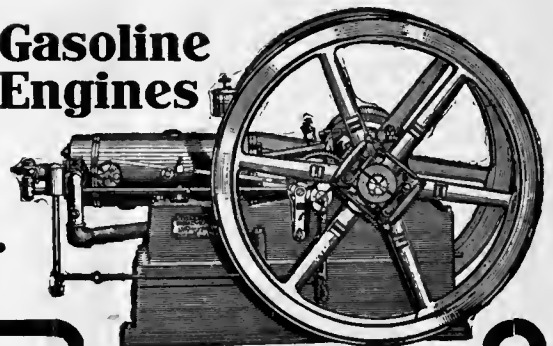
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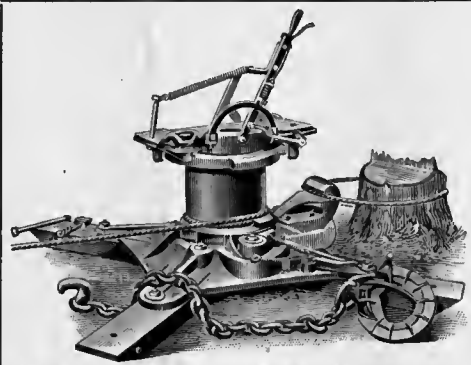
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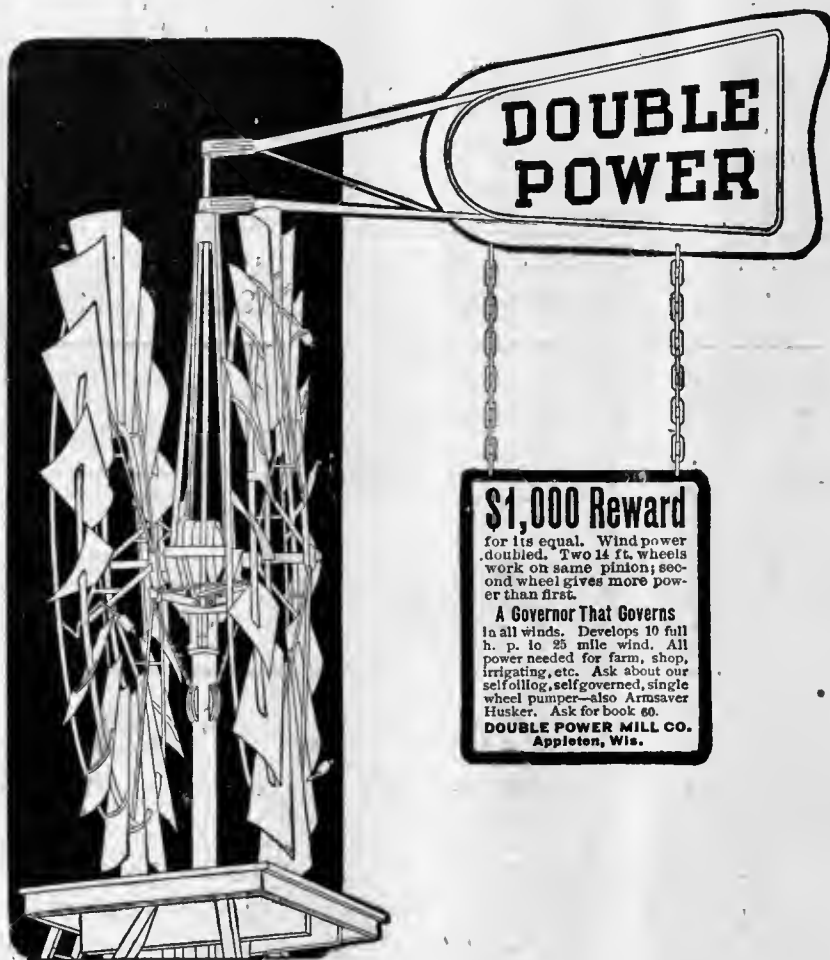
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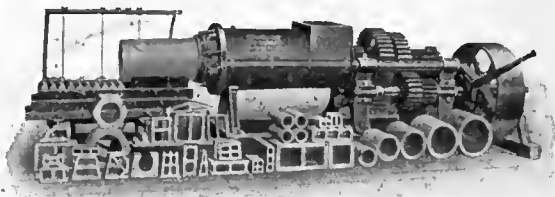
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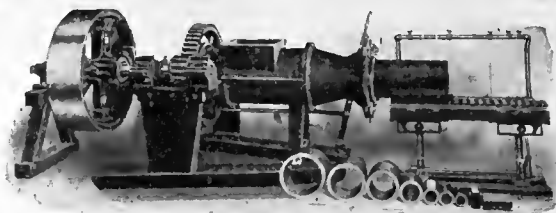
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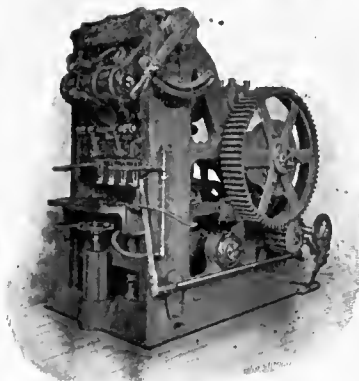




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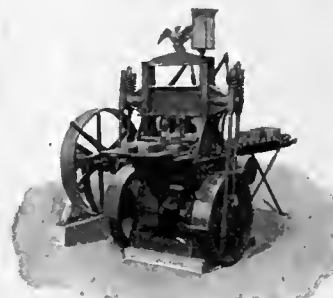
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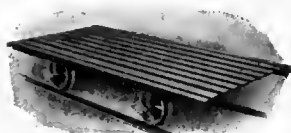
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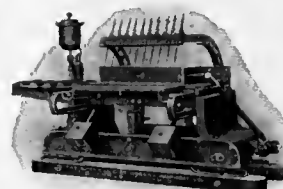
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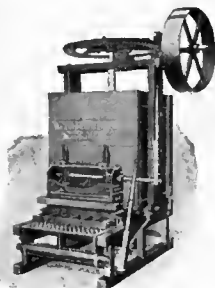
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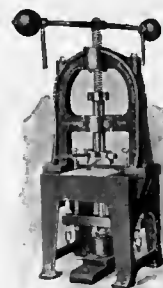
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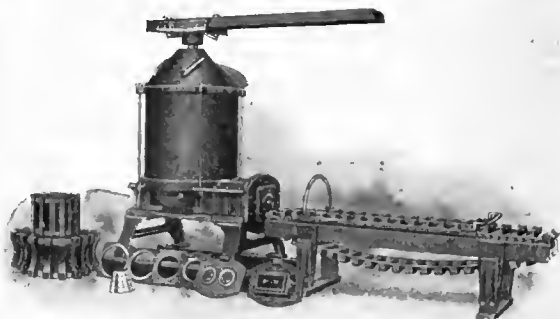
Soft Mud Machines, Horse and Steam Power



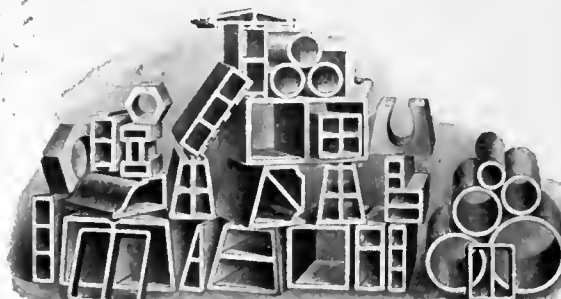
Disintegrators



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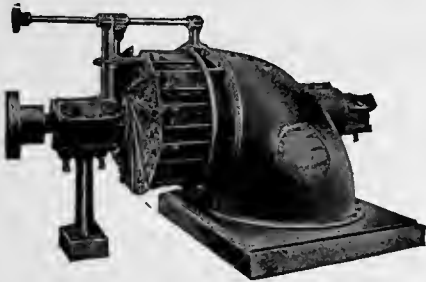


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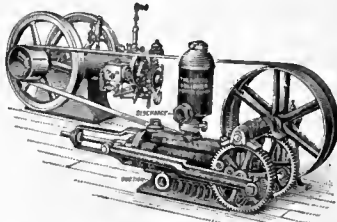


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FIG. 952

HORIZONTAL BULLDOZERS, 3' to 6' CYLINDERS

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BACK GEARED
WORKING HEAD

TAPPED FOR
3" PIPE

5, 7½ and 10'
STROKE

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BELT, WIND OR
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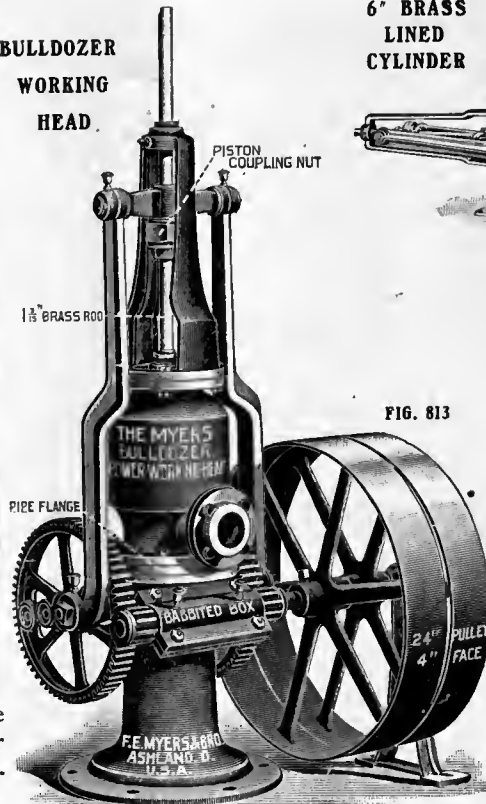
FIG. 1113

2½" DISCHARGE



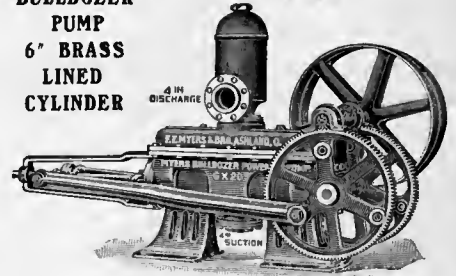
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WORKING
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BULLDOZER
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LINED
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FIG. 1079



MYERS BULLDOZER
WORKING HEADS

No. 359

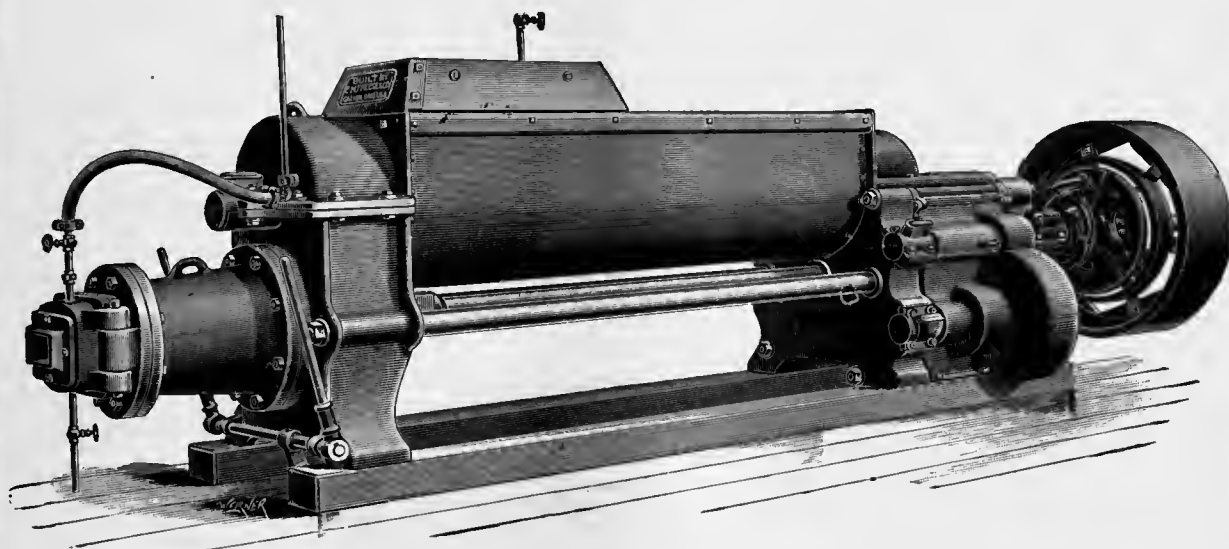
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SUCTION 2 to 4 INCHES

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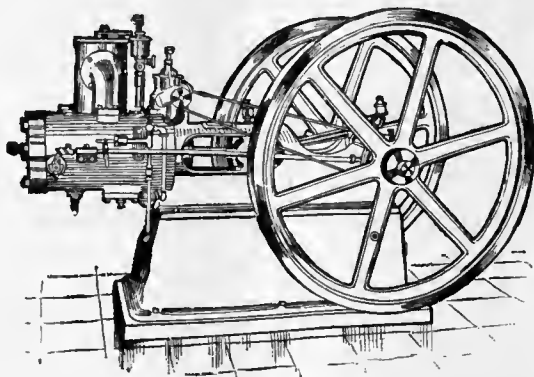
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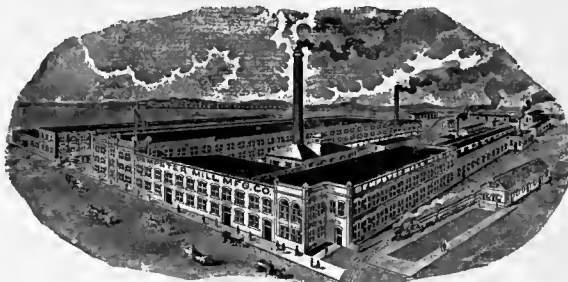
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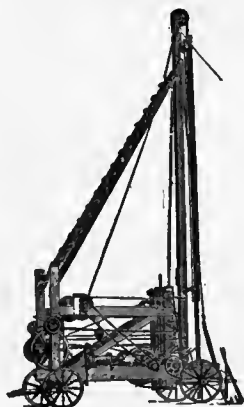
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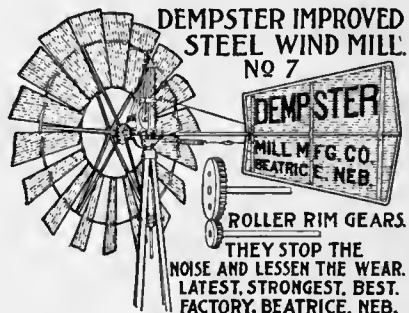
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THE IRRIGATION AGE

VOL. XXI

CHICAGO, FEBRUARY, 1906.

No. 4

THE IRRIGATION AGE

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THE DRAINAGE JOURNAL
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It may interest advertisers to know that *The Irrigation Age* is the only publication in the world having an actual paid in advance circulation among individual irrigators and large irrigation corporations. It is read regularly by all interested in this subject and has readers in all parts of the world. *The Irrigation Age* is 21 years old and is the pioneer publication of its class in the world.

Irrigation Congress. Do not forget that the Fourteenth National Irrigation Congress, to meet at Boise, Idaho, this year, will be one of the most interesting meetings of that character ever held. The public spirited citizens of Boise and Idaho generally are planning to make this a memorable gathering both in point of attendance, character of work accomplished, and entertainment offered the delegates. The date of this meeting will be given in our issue of March. The American Irrigation Federation will hold its first annual meeting at Boise at the same time, but will in no wise conflict with the deliberations of that body, with which it is in perfect accord.

The Flathead Reservation. We are presenting in this issue an illustrated article on the Great Flathead Reservation in Montana, written by Maj.

W. H. Smead, of Missoula, Mont., formerly U. S. Indian Agent in charge of that reservation. Those of our readers who are desirous of securing additional information concerning this section of one of the best states in the West, may feel at liberty to correspond with Major Smead, who will gladly answer all inquiries. *THE IRRIGATION AGE* has said much concerning Montana and her glories but with all of our illustrations and descriptive matter, but a faint idea may be obtained; one must visit that State to realize its possibilities or comprehend its grandeur.

Tells of Irrigation Work. In an address on reclamation work in the West before the National Geographic Society recently, C. J. Blanchard, of the Geological Survey, declared that seventy-seven miles of main canals of river size have been built during the three years in which the United States Reclamation Service has been organized and irrigation canals long enough to span the earth twice and representing an outlay of \$90,000,000 had been built the past quarter century.

"Every year," he said, "this area returns a harvest valued at more than \$150,000,000, and 2,000,000 people dwell in harmony and content where only a short time ago the wilderness reigned.

"The Reclamation Service has built fifty-four miles of irrigation canals and 186 miles of ditches. It has constructed and has in operation 150 miles of telephone, 125 miles of road in canons, involving deep cuts, it has excavated 10,000,000 cubic yards of material and one-half mile of tunnels. Work is now actually going on in eleven different projects."

Mr. Blanchard is perhaps the most popular man connected with the Reclamation Service save C. E. Grunsky. Mr. Blanchard told his audience something that *THE IRRIGATION AGE* has long attempted to emphasize, viz., that the outlay of \$90,000,000, 80 per cent of which was expended by private corporations, has made the West "blossom like a rose." He failed to explain, however, why the Reclamation Service is so persistently trying to kill all effort in that direction

and why the Government should crimp every legitimate private project. Until this sort of work is stopped this service may expect trouble which may land some of its leading spirits back to the class in which they rightfully belong.

The publishers of daily and weekly papers throughout the West are requested to correspond with us on the matter of offering **THE IRRIGATION AGE** on a clubbing arrangement to their readers. We will quote a low rate to all who care to offer this magazine in connection with their own. It is our impression that a large number of people throughout the country are anxious to learn about irrigation development in the West and would pay for a combination like this more readily than for a single paper.

It may be that our readers have seen a notice in various papers in regard to a magazine supplement which is being published in New York and furnished to local papers throughout the western country, free of charge. This supplement is gotten up like the ordinary ready print productions, the difference being that it is a complete paper in itself, containing some articles of general interest, stories, illustrations, etc., and the publishers are supposed to be deriving a large revenue from the advertisements. It is understood that their service already includes something like one thousand papers and the circulation, giving each paper an average of say, one thousand copies, would be quite considerable.

There has been a question raised by several of the leading magazines as to just what was behind this movement and for a time it was conjectured that a catalogue house or some number of catalogue houses might be supporting it for the purpose of eventually running in matter favorable to the parcels post. This move would, however, not be taken until the papers accepting this service became accustomed to the supplement and were less vigilant in examining the contents features. Another suggestion was that some of the large manufacturing trusts were behind the proposition as it is definitely known that the promoters of the scheme have two hundred and fifty thousand dollars with which to carry on the plan during the first year's campaign. We are now convinced, after careful investigation, that the main purpose of this supplement is to boost governmental appropriations for irrigation purposes, which will naturally result in millions of dollars' benefit to the ones on the inside who have or will secure land under proposed irrigation projects.

The active head of this organization is known as the representative of large corporate interests who are working for the repeal of certain land laws, which, if carried into effect, will make at least one hundred

and twenty millions of dollars for the parties interested, so it may readily be seen that they can well afford to invest something like two or three hundred thousand dollars to educate the public to their way of thinking. There are also connected with this individual many public officials who have considerable pull. Country publishers throughout the West should be very cautious in accepting something which is offered to them for nothing. Publishers of this class are usually very bright, intelligent men, but with all their shrewdness are at times led by schemers to commit their journal in favor of deals which the publication would not for a moment editorially indorse. A general view of the situation and conditions lead us to believe that this organization is attempting to hoodwink the reputable country publisher and thereby gain a large sum of money by the repeal of these laws under the claim that they are assisting in the carrying out of a plan which will materially benefit the homeseeker, when in point of fact, nothing could be done which would be more detrimental to the man who is looking for a cheap home in the West; which would be of more injury than the repeal of the laws indicated. What we need is the proper enforcement of the present laws. If this is duly carried out nothing more is necessary.

Let the country publisher bear this fact in mind—the power which is capable of causing the repeal of any of our present land laws is also strong enough to introduce and pass any substitute it may offer.

One of the attributes of graft is to attach itself or its unsavory cause to meritorious endeavor and shift its disrepute to the shoulders of creditable purpose. It is obvious that recently an immense slush fund has been created by certain corporate interests to antagonize impending legislation and work toward the end of repeal of certain laws, and the instruments selected to conduct this "campaign of education" is under the pretense of friendliness to federal irrigation, so skillfully interwoven purposes, that the benefits of the National Irrigation Act itself is imperiled. It may possibly be interesting to the publishers of country newspapers throughout the West, who have received offers lately of free plate matter and in many instances have been offered, free of charge, special so-called "Magazine Supplements," for which they have been paying a moderate sum in the past, that the men who are making these offers have a tremendous scheme to carry through which will benefit a few large land holders and other large corporations to the extent of from one hundred to three hundred million dollars, and it is the aim of the people who are offering this class of free reading matter to use the columns of the country newspapers who are duped by these fulsome offerings to carry out the plan of the repeal of the following laws:

"The Commutation Clause of the Homestead Act," "The Timber and Stone Act," and the "Desert Land Act."

Perhaps it will interest the reader to know that all of these acts were good in their original plan and are today, if properly enforced. Many abuses have been committed under these laws, as under thousands of other laws on record, but no abuse need have been necessary had a proper enforcement of these laws been insisted on by federal officers whose duty it was to look after the matter. The object in circulating this large amount of free matter through the kindness of the country publishers who perchance think that they are getting something for nothing, when in point of fact they are only being made the cat's-paw for a band of scheming grafters who will benefit to the extent of hundreds of millions of dollars if these three laws are repealed.

To be more explicit, if these three laws are repealed the only opportunity left for the home seeker, the toiler and the wage earner, to secure land in the West is by taking it up under what is known as the old or original homestead law, which requires five years' continuous residence on the land to secure title. This law worked very well in the eastern and central States where a man could start in and make a living from the first day of his settlement upon the land. Conditions are vastly different, however, in the arid West, where five years' continuous residence on a homestead to perfect title to same is an impossibility, and the men who are working for the repeal of the three laws named are as well aware of this as the writer and many others. They know, moreover, that these laws having been repealed and the old homestead law an impossibility, the only other recourse for the homeseeker is to purchase land from the large corporations who have corralled them to the extent of sixty or seventy millions of acres. Moreover, the purchasers of land from these corporations will pay the price asked by the men who now hold the fee. It is also a well known fact that all of the sixty or seventy millions of acres of land would have been gladly disposed of by the owners five or six years ago at for from 50 cents to \$1.00 per acre. It is also generally known that if the repeal of these laws is effected, this land will immediately jump in value from two to five dollars per acre. Assuming then, that it only increases in value two dollars per acre after the repeal of these laws, it is clearly evident that at least one hundred and twenty million dollars will be lifted from the public pocket by this band of individuals who are paying two hundred and fifty thousand dollars a year in support of the men who are getting out what is known as the Magazine Supplement for country newspapers; in other words, the country publisher holds the bag and distributes this sort of literature for the benefit of a lot of people

who will eventually win out to the extent of one hundred and twenty, perhaps three or four hundred millions of dollars. Is this not a fine condition of affairs? Is it not a pleasant position in which to place the country publisher—that of being worked by a gang who will lift out several hundred million dollars through their efforts? The country publisher who would use this class of stuff must perforce have a fine opinion of himself to use his list of subscribers as a means of putting millions into the pockets of men of that character.

We attempt in this manner to explain the situation; in fact the country publishers should understand it. If they contemplate charging this band something for the use of their circulation the proposition is immediately given a different aspect. If, on the contrary, they are giving everything and receiving nothing, what are we to think of their business methods?

To reiterate, let the present laws be properly enforced, they are good enough, and if the same time were spent in seeing that they are honestly enforced which has been spent in efforts to reach into the pockets of the homeseeker, our political and moral conditions would be much better and more harmonious.

It will, moreover, pay publishers of journals throughout the country to keep posted on a subject of such great importance as the development of the West under irrigation. It will also be well for them to learn about "the darky in the wood pile" as explained in *The Boston Commercial* of December 9, in part as follows, all of which will be fully treated in future issues of IRRIGATION AGE. We give below part of the article from *The Commercial*, which is headed "A Gold Brick," the part quoted following an explanation of how free supplements are offered to publishers:

"The darkey in the woodpile' is now making his appearance in the matter inserted in these supplements. It turns out that irrigation of some arid lands in the far West, for the benefit of a few individuals, the cost of irrigating, which is to be paid for by the United States Government, is the object of the supplements.

"Publishers to whom they are given are expected to issue them with their regular publications in order that public sentiment may be worked up in favor of obtaining from the Government expenditures of millions upon millions of dollars so that these almost worthless lands may be increased in value and sold at enormous profit for those interested.

"The newspapers are to be made the catspaw for this purpose. The promoters of the scheme can well afford to spend several hundred thousands of dollars, largely contributed by a few railroad companies and interested individuals, for, by so doing, the United States treasury may be tapped for millions, and the people of the East, South and middle West taxed in order that the owners of this arid land may be benefited."

EDITORIAL NOTES.

BY G. L. SHUMWAY.

TO ONE unfamiliar with irrigation many features appear incredible. The magnitude of present undertakings, possible results, and tremendous volume and value seem as chimerical as an Arabian Night's dream. The chronicler can index an acre producing nothing of value, and only a few rods away another producing a hundred—yes, a thousand—dollars from one year's crop. No many years ago the two acres were twin arid brothers. The transformation of one is due to cultivation and intelligent application of water.

IN THE West Federal enterprises of a magnitude almost inconceivable are under way or contemplated—projects which would involve expenditure of millions and will reclaim sufficient area to support a nation. Add to this hundreds of thousands of acres being reclaimed by private enterprises—H. G. Leavitt in the North Platte Valley, Jay Turley on the silver San Juan, A. H. Heber in the Imperial country, C. G. Guernsey and others in the Big Horn Basin, and many others.

TO OCCUPY and properly cultivate these areas will require a rapid influx of population. Every million acres reclaimed will add fifty million dollars taxable property to the country's wealth, for without unity of soil and water both are valueless. With indifferent cultivation, each acre will yield twenty-five dollars annual product. Two years' product from an area which before produced nothing will repay the total cost of reclamation and some to spare. With intensive farming, production may be doubled and quadrupled. Counting population of the town, an irrigated community will support one inhabitant to the acre.

THIS magnificent benevolent purpose is worthy of exultant approbation, and conscious of its inevitable perpetuity, shrewd attaches of corporate interests have identified themselves with Federal endeavor. Legislation, desired or dreaded by their masters, at times demands herculean effort and today their press bureau is over wrought. It is asserted that powerful antagonists of President Roosevelt have placed an inconceivable amount in trusted hands, which provokes press activity under a cloak of interest in the development of the arid West.

THE pernicious purposes may be perceived by scanning columns parallel to those devoted to irrigation. One contains coarse compliment—appeals to vanity in which selected executive or statesmen are their victims; another column deals in educational matters, in bungling attempts to intimidate the president, or sinuous endeavor to create popular sentiment.

ATROCIOUS insolence and method alike indicate the essence of graft, and, unfortunately, some Eastern scriveners, observing preponderance of irrigation matter, have directed opprobrium and odium upon the National Irrigation Act, which is natural, but wrong. While acknowledging an unfortunate affinity exists between some reclamation officials and these corporate janizaries, it is an imperative duty to resist aspersion that is born of error, and briefly illuminate disreputable attempts to shift the burden of ignominious designs.

WITH blundering frenzy and unprecedented liberality, this Maxwell coterie have fetched censure upon whatever purpose or personality they fain would favor. A compliment in their productions and the specified individual or motive becomes a cynosure of suspicion. Justly or unjustly, this is inevitable. As these specialists have fastened themselves upon a benevolent purpose to ultimately use it to steady their craft of infamy, so good men, high in the walks of life, are victims of its wiles. Craftily playing on the passions of ambition, they trust that acquiescence will compromise selected statesmen and in a measure commit them to defensive attitudes, which will eventually confuse the public mind and involve the personality to the extent that Maxwellian inordinate desires will be supported by the individual's endeavors to extricate himself.

THE West has bountiful allurements, but with Eastern periodicals illustrating sensational, erroneous conceptions in fiction, and with "halo-wearers" illuminating Western ambitious characters as steeped in fraud, what can be sufficient to induce desirable citizenship? New development is providing Arcadian environment for many million people, and pioneers of the idea, as well as in fact, do not take kindly to illusions which traduce. They do not possess endowments which Maxwell and his coterie are wont to attribute.

THE engine of duplicity employed by Western railroads is neutralizing development. The lubrication they supply is working them disaster. It asserts the leaven of dishonor permeates the entire Western social fabric, it generalizes accusations which compel the layman reader to imagine loose moral environments will be inevitable if he migrates West. Desirable citizenship hesitates about bringing families under such baneful influence.

IS IT impossible that one of the near future events will be a formal repudiation of Mr. Maxwell by the railroads? His work is menacing to their prosperity, and they can ill afford to contribute to a purpose which is having such reactionary results. Rate legislation may not be best for railroads, it may not be best for developing communities, but it is a more desirable alter-

native than a continuation of these sweeping, discrediting allusions.

A TRUE prerogative of government is to ferret out fraud and punish offenders, but it is wrong to asservate that fraud exists where fraud is not. It is not right for Government to encourage or commission men or associations to publish to the world statements based on generalized opinion of some incompetent or over-zealous attache—statements which malign a whole community.

To BE specific, Nebraska has the section Homestead law covering semi-arid areas. Entries in territory segregated for the North Platte Project are limited to quarter sections. The territory is largely covered by flings and rude ephemeral initial habitations abound, many of which are being replaced by better structures. A zealot of the department has felt called upon to photograph some of the cruder domiciles and Maxwell reproduced them in his thousands of free "magazine sections" of rural papers, illustrating an article by Mr. Byrd, entitled "Fools the Land Thieves." The pictures are designated as "A group of fraudulent land entries—Attempts to hold Government land claims under the Government's North Platte Irrigation Project, Wyoming-Nebraska—Photographed by Government Inspectors." Probably a million or more readers have had this abominable rot before them. The whole of a prosperous and rapidly growing community of good American citizens has been foully maligned, and some slop-over subordinate of the Government has put the Department in the unenviable position of being a partner to the slander. That the calumny is unwarranted is evidenced by Governmental attitude. No arrests have been attempted, no formal charge of fraud made, and barring possible undiscovered isolated cases, it does not exist.

LET us diverge sufficiently here to observe that the limited acreage and projected Federal irrigation are evidence of legal cognizance of the impossibility to make a living on these lands before water is ready to apply, and any order or ruling compelling continuous residence prior thereto is a most serious error of judgment. Claimants will be better equipped to succeed if permitted absence to work on farms already under irrigation.

COMPLAINTS come frequently of housebreaking during temporary absence of claimants, and these have crystallized to an opinion that over-zealous Government inspectors commit the depredations to secure interior views of domiciles which is confirmed by Mr. Maxwell's reproductions. Also by the fact that while contents of houses are overhauled, nothing is stolen. Lack of definite knowledge and ignorance of the personality who purported to represent the Government has prevented an arrest for felony. The persecutions should discontinue.

It is pertinent here to suggest that while the honorable secretary, Ethan Allan Hitchcock, doubtless appreciates public approbation of his sterling character, it is not likely he approves of any exploitation of his personal endowments if conscious it is at expense of thousands of innocent citizens who are honestly hoping to build homes under the North Platte or any other project.

WE MAKE bold here even to remark, if in his prosecutions of offenders of the law, it were possible to minimize publicity without reducing vigilance, honest citizens of affected districts would, for the courtesy extended, cloister closely to their bosoms that deep appreciation which sympathy of heart for the sanctity of home inspires. If he will weed out the loud-mouthed hypocrites, who blast and blacken whole commonwealths to exploit their own assumed virtues, he will win that approbation which is the most glorious jewel in ambition's crown.

AGAIN we may remark, with appropriate consideration for the Interior Department, if Mr. Hitchcock will direct reclamation officials to devote more time to prosecution of their legitimate work and not so much to intrigue and "peanut politics," the work would bear more dignity and reflect more credit on department and the Nation.

TO ILLUSTRATE: At a recent election of a Water Users' Association, approximately ten thousand votes were cast. By virtue of proxies accumulated, two individuals, personal friends of the Federal engineer in charge, cast about six thousand votes. The secretary of the association, who is not even a member, makes mention in a local paper: "It was a love feast. There were no contests," etc. There were no contests for—What's the use?

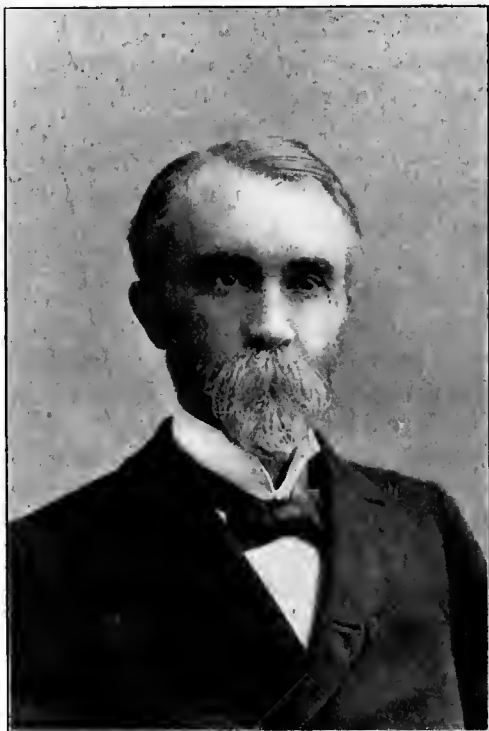
AGAIN: Government work can not move forward with celerity when engineers will neglect duties to inspire inane, fawning beneficiaries or truckling volunteers to malignant correspondence. Duty is subordinated for perfidious endeavor. With transits and computations in subaltern hands, chief sinecures direct insensate clowns to sinister, insidious, unpardonable confidential essays. These cowardly excrescences are to be used craftily on higher authorities with infamous corollary and deliberate intention to deceive.

IT WAS hoped and expected that when the National Irrigation Congress formally repudiated the National Irrigation Association that heads of the Reclamation Service would see a drift of sentiment and divorce itself from a companionship which is detracting from its usefulness. But instead it seems stricken with a frenzy. Federal irrigation under that standard of influence is inconceivable. It is an incompatible relationship when considering the attributes of our National Executive.

IRRIGATION IN THE SOUTHWEST.

BY A. J. WELLS.

When a lecturer before one of the Boston clubs a few years ago said that the arid lands west of the Rocky Mountains were "the ideal lands for agriculture," his words provoked a laugh. But they were true. The only scientific agriculture is irrigated agriculture and the more nearly the lands to be cultivated are rainless, the more nearly ideal are the conditions. This is especially the case in the Southwest where the rainfall is slight, the soil fertile and the climate semi-tropical. This puts the problem of production where the farmer who has an irrigating ditch can solve it by a turn of his wrist. The three factors are: Soil, warmth and moisture. Given these and the farmer who does not raise a good crop every year has himself to blame and not the weather; for the arid lands are the fertile lands over wide areas. They are not leached by excessive rainfall,



Mr. A. J. Wells, San Francisco, Cal.

and 300 cloudless days in the year provide plant life, the stimulus at once of light and heat, while moisture distributed when it is needed and where it is needed insures the conditions of tropic growth without the perils of the tropic climate.

Prof. Elwood Mead, studying the subject in the field, traversing both humid and arid regions in search of facts and visiting the great irrigated regions of Italy for data, says of irrigation in humid lands:

"Under irrigation the farmer is practically sure of his crop every year. In ordinary or extra dry years the crop is increased two and sometimes three fold. The crops are always of superior quality."

Now if these are the results in humid regions, "what should the harvest be" in the sunny and fertile lands of the Southwest? In the words of the old Hebrew

prophet, "if these things are done in the green tree, what shall be done in the dry?" If these are the advantages of irrigation where rainfall is more or less ample and the climate cold for half the year and variable for the rest, what can not be done where winters are green and summers are brown and the days of sunshine exceed those of Italy or the south of France?

One of the practical results of irrigation will be that the farmer of the twentieth century will appreciate climate as a factor in successful farm work. He has been covetous for broad acres, and has "bucked" against inclement skies as patiently or as contentedly as he might, and generally has not weighed the advantages of a mild climate against a big farm. But climate that will stimulate plant growth and invite the plant grower out of doors, that will push the farmers' crops and be considerate of the farmers' comfort, has a cash value. There are larger and better crops on a given acreage. The fruits of the summer's labor is not consumed in the inactivity of the winter; growth goes on all the year, production does not cease, the soil yields two harvests and stock is cheaply provided for. Irrigation reduces the land area necessary to a livelihood, so that twenty acres suffice, and forty acres are an abundance; makes midsummer green with the loveliness of spring, obviates or lessens the dust and discomfort of dry weather and "makes it possible to create rural homes which represent an average of human comfort" such as were never seen on the prairies or in the woodlands of the middle West. These considerations are drawing many to the Southwest, and the National Irrigation Act of 1902 is providing for a large increase of population by the great irrigation systems in process of creation, or awaiting future development in "the land of little rain."

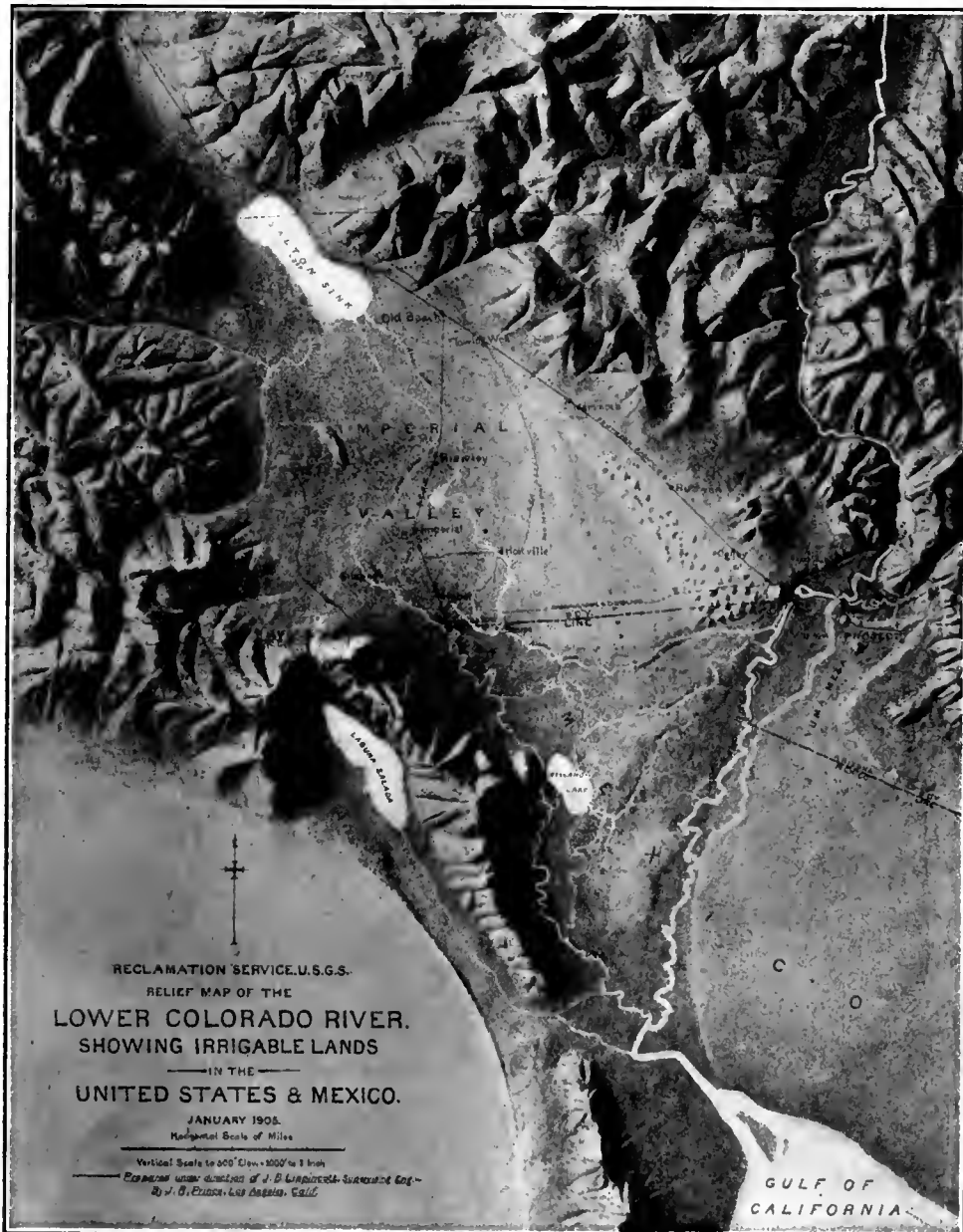
What irrigation will do in the sands of the Colorado desert is shown in the success of the colony around Imperial, a town of more than 2,000 people and connected with four other towns and surrounded by hundreds of cultivated farms, the whole the growth of the years since January 6, 1902, when a corps of surveyors first broke ground for an irrigating system. Some interruption of this remarkable growth has lately occurred, owing to the failure of the engineers to provide for the safety of the intake from the capricious river, but this is temporary, and perhaps helpfully emphasizes the importance of government initiative and control when dealing with water supplies from delta rivers like the Colorado here and the Sacramento in California. But the beginning of a complete transformation of a large area of the desert section in southeastern California is here. Here are growing melons equal to any in Persia, and a Garden of Dates promises to stock a region which the government experts think quite adapted to this characteristic fruit of Asia. So that we need only to import a few Arabs and recover the government camels that were lost in Arizona years ago, to make this desert look like a section of North Africa.

The extensive plans of the federal engineers have begun to take shape above Yuma and the irrigable area here is immense and much of it adapted to citrus culture. It would not be surprising to see here a new orange district; and as the river carries in its red current a vast load of silt the fertilization of orange groves will be a natural process.

Yuma is traditionally warm, but it is dry, drier, driest, and is at once wonderfully healthful and quite

comfortable. A great growth of population is inevitable as soon as the lands adjacent are provided with water. In the garden valley of Arizona, Salt River and the Rio Verde are being dammed, the great camp of the Government at Roosevelt working day and night to complete the Tonto Basin scheme.

of trees that he gasps with astonishment. It is "the miracle of irrigation," and as he finds health in this arid land, his only regret is that water is not available for larger areas. For this means bounty and blessing, it means homes and income for a multitude for whom the climate holds something that medicine can not give.



Relief Map of the Region Watered by Colorado River Projects—This map shows not only the region to be irrigated by the Government's Yuma project—100,000 acres in Arizona and 17,000 acres in California—but marks plainly the great Imperial basin of California, where private enterprise has developed the most wonderful example of the benefits of irrigation to be seen in this country. Here, in a below-sea-level arid region, are nearly 100,000 acres under irrigation and producing marvelous crops; 150,000 more capable of irrigation when the work is completed; and three thriving towns with an aggregate population close to 10,000—all this accomplished in less than three years. The water for all this work is diverted from the Colorado River.

Doubtless the readers of the IRRIGATION AGE are familiar with the details of this great plan, but only those who have seen what water can do in this sunny realm and in this fertile soil, can realize how much an adequate irrigation system means to this valley. Here the easterner steps out of the desert into such wealth of field and garden and orchard, and comes off of the sunburnt plains into such richness of color and shade

Here irrigation is a necessity, and here, where there are sometimes 300 cloudless days in the year and winter is but a prolonged spring, the farmers' returns tax credulity. But it is probably true, as the Governor of Arizona said two years ago, that "Agriculture in the territory has reached the full extent of the natural water supply," and the blessings of the Reclamation Service are therefore hailed as the means of increasing the pop-

ulation. The acreage that can be cultivated is immense, and a great system of storage reservoirs will be better than the granaries which Joseph established in Egypt, for they will be a perpetual source of wealth.

The valleys of the Gila, the Santa Cruz and the San Pedro rivers will furnish a large water supply if wisely developed, and fruit growing, diversified farming and stock raising will attract new settlers.

Southern Arizona is Agricultural Arizona. It is traversed by the Southern Pacific and its branches, and while the north is high and broken and cold, perpetual summer lingers in the lowlands of the South. Oranges, figs, dates and olives are successfully grown and seven crops of alfalfa in one season invites the dairy, and with

ten miles wide, and the county is known as the "Garden of New Mexico." As the county is nearly twice as large as the State of Delaware, the size of the "Garden" can be estimated. The Spaniards were here about the middle of the sixteenth century, and it is believed that fully 40,000 acres were anciently irrigated. As this is as many acres as are now cultivated, and as the population of the county is but 13,000, it is evident that there is room here for improvement and a place for men of enterprise. Much land is still subject to entry under the land laws. There are said to be 100,000 acres in the valley of the Rio Grande in this territory, and only about 40,000 acres under cultivation. There is a tremendous underflow of the great river and it is available



Irrigation Scenes in the West—The Thriving Little Town of Roosevelt, Ariz., Is Built Where There Will Be Two Hundred Feet of Water When the Dam of the Salt River Project Is Completed.

this goes hogs and poultry and a quick income. The vast mineral resources and permanent mining camps provide a good home market.

The same general conditions obtain in New Mexico, and the gardens and populous and prosperous communities which flourished here when Coronado visited it some hundreds of years ago, are to be revived in the valley of the Rio Grande and elsewhere by a wider and wiser use of water.

The great irrigating dam over the torrential river, provided for in the plans of the National Government, will greatly add to the prosperity of a rich valley. Midway of Dona Ana County the valley is from seven to

at about twenty-five feet, and pumping plants are somewhat in use. The Rio Mimbres is also a stream running upside down for much of its course, and an association has been formed to impound and use the sunken waters. The cost of pumping has been shown by the New Mexico Experiment Station to be not more—generally less—than the cost of water purchased from water companies. Alfalfa and vegetables can be profitably grown in this way, the Experiment Station showing that onions can be made to produce \$500 per acre when sold at 2¼ cents per pound. Wells and windmills and pumping plants of oil or gasoline will irrigate a good deal of territory here, but dependence for the most part

must be placed upon co-operative effort, or upon the general Government and storage reservoirs. But there is room enough and promise enough to attract a large immigration, and as compared with Canada and a large

Finding an old irrigating ditch on a run-down farm at Gilmanton, New Hampshire, Jere Sanborn opened it up, utilized it, and with the aid of manure, in a few years quintupled the crops, quadrupled the stock and



Irrigation Scenes in the West—An Irrigation Canal at Las Cruces Agricultural College in the Rio Grande Project, New Mexico.

acreage, the advantages of New Mexico and a small farm are great.

Here is the "sure crop argument," and the "great crop" argument, and given an adequate and unfailing

multiplied the number of persons supported by the farm by eleven. Under the old methods it produced 112 tons of hay; irrigation raised the tonnage to 800—an example of what a little farm well tilled will do in sterile and



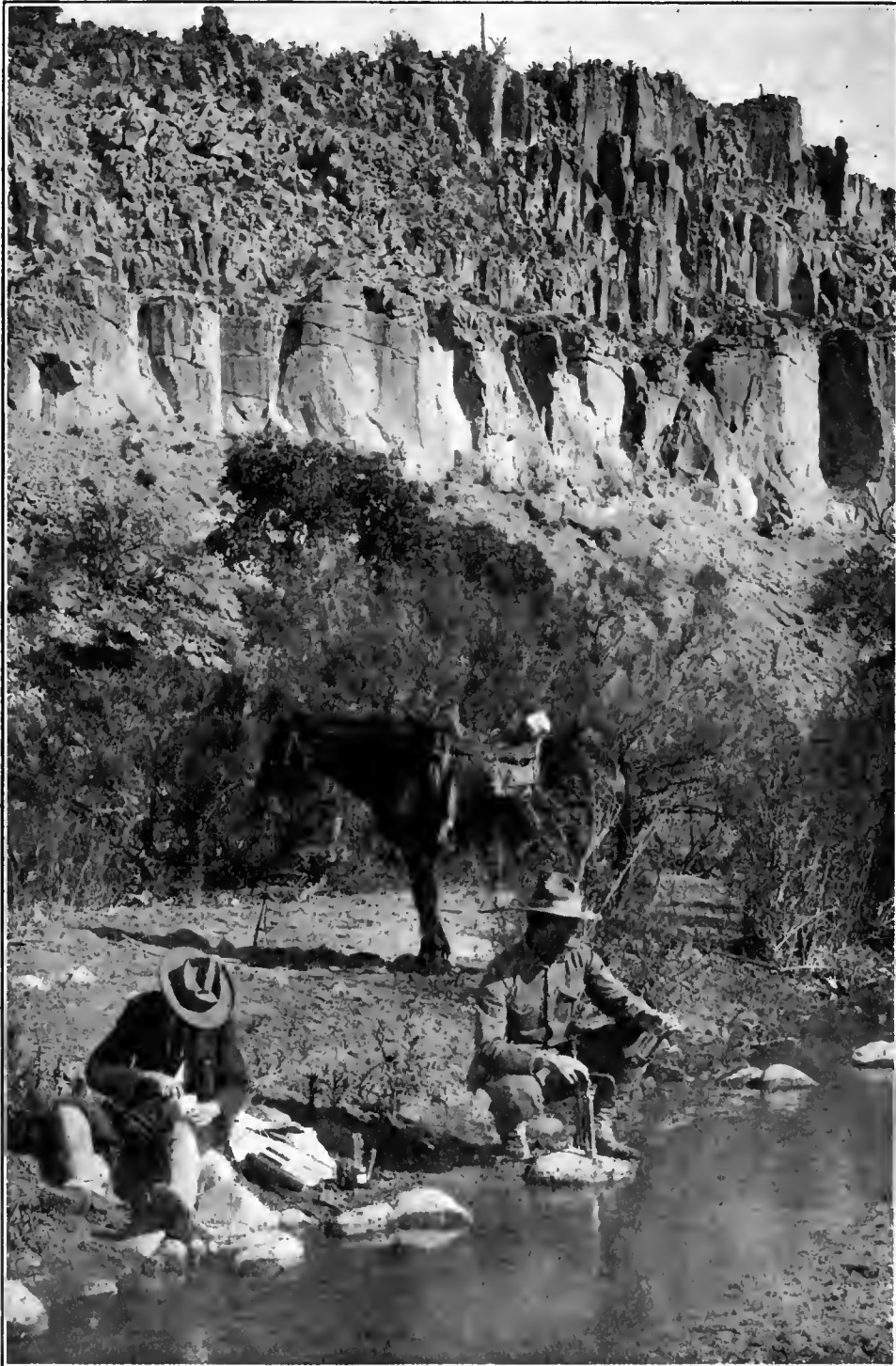
Irrigation Scenes in the West—Indian Laborers at Work Constructing the Globe Road—Salt River Project.

water supply a man's land in this climate has a perpetual endowment—an invested fund from which he can draw while he cultivates the land, and which will greatly enhance the land's value when he comes to sell it.

bleak New England under irrigation. Here, with rich soil and the very kindest climate, it is impossible to convince an eastern man who has not seen it, what moisture will do for plant-life of every kind. Both the in-

vestor and the farmer can make money in the Southwest, but it is a place for the man with brains and fertility of resource. If one thinks it late in the day for opportunity, he is mistaken, and does not at all see

men are taking the place of the slow-going manana people who inherited the land, there are unlimited opportunities for the man of energy and thrift. Scientific irrigation, involving scientific agriculture, is rapidly



Irrigation Scenes in the West—Reclamation Service Men Testing the Waters of Cherry Creek, Salt River Project, Arizona.

the promise and potency of this great irrigation movement. "The West," the historian, Bryce, said, "is the most American part of America," and because this is rapidly becoming true of the Southwest, and progressive

changing title deeds, and in the endless shuffle for place on the planet, the man who can do things is coming to the front here as elsewhere.

THE YELLOWSTONE VALLEY AND MONTANA, AROUND BILLINGS.

Montana is as large in area as Illinois, Indiana and Ohio combined. Those three States sustain a population of nine million people in comfort while Montana today has less than 300,000. But there is a difference in Montana and these prairie States. The pioneer could cope with natural conditions there; he needed no capital but his energy; it required no outlay of money to insure water for his fields, the rainfall took care of that. So the country settled up without the capitalist. In Mon-

to the eastern farmer. Naturally the query arises—if land in Iowa or Illinois that can produce only fifteen or twenty bushels of wheat to the acre, or their usual quota of corn, oats, barley, hay, etc., all of which must be marketed at Chicago prices, is worth from \$100 to \$125 an acre, what must this Yellowstone valley land be worth that can produce double, treble, or four and even five times as much to the acre, and all sold at local prices far in excess of what the same products would command in the East? And yet a farmer can get an eighty or “quarter” in the Yellowstone valley for far less money and on easy terms.



A Truck Garden.

tana the resources are all there in greater profusion and wealth than in any eastern State. Nature supplies an abundance of water, but man must attend to the distribution of it himself. The capitalist has met this

Concerning the water supply, there are 25 lakes of notable size in Montana, 80 large rivers, and 362 smaller streams. No State in the Union is better watered. The map shows that it is to the western part of the State



Irrigation Scenes in the West—The first Cutting of Hay on an Alfalfa Farm, Near Las Cruces, in New Mexico, Within the Rio Grande Project.

demand, and everywhere in the State irrigation is being developed to its highest degree. In the more favored valleys, the results have so far exceeded the most sanguine expectations that farmers have been amazed at the results. A glance at the achievements in the Yellowstone valley, close to Billings, reveals startling figures

that Montana owes its reputation as a mountainous country. It is here that mining has been developed to such a remarkable degree, and it is in the cities and towns of western Montana that the great Yellowstone valley will find its best market for produce of every description. Eastern Montana is an open range country,

devoted largely to the raising of stock. The great Yellowstone and tributary streams flow through valleys which have the finest agricultural possibilities in the Union, and while the present federal and private projects within the State command attention and admiration, many more will ultimately be developed and present still greater opportunities for prospective settlers. Those who are looking for information concerning that State should write the Boosters' Club, Billings, Mont.

Concerning Montana and her possibilities, we quote from a recent article by Mr. Buchanan, secretary and manager of the Boosters' Club of Billings:

"Private enterprise has already accomplished a great deal for the reclamation of the Northwest, and that, too, in the face of untold obstacles. Within a

covered with sage-brush. There are only a few thousand acres of this great valley that is under cultivation just now, but the crops on these have been enormous, and experiments have shown that it is adapted to general farming and is particularly favored for fruit growing. Along the Yellowstone River for three hundred and fifty miles are dozens of ditches of lesser size, and land is still comparatively cheap. Nothing has been done to advertise the country; railroads have preferred to devote their influence toward the settlement of the Puget Sound country and other remote sections. Eastern Montana and northern Wyoming are today the last of the old frontier. For years past thousands of settlers bound for the coast have passed through valleys more fertile than those at their journey's end. These valleys



Irrigation Scenes in the West—Looking Down Fish Creek Canyon a Short Distance Below the Point Where the Phoenix Road Crosses the Canyon—In the Salt River Project, Arizona.

radius of twenty-five miles of Billings there are seven great irrigating canals, aggregating over two hundred miles in length and watering over one hundred thousand acres of land. The largest of these is seventy miles in length. It pierces a bluff three hundred feet high, with a tunnel through the solid rock for eighteen hundred feet; it leaps over a chasm with a flume nine hundred feet long, and waters forty thousand acres of the upper portion of the Billings flats. The lower portion of this valley, which is far prettier to the eye of the farmer than its name would imply, is within the ceded strip, and it is here that the government will construct its first ditch, reclaiming thirty-five thousand acres that is now

needed but the magic touch of water to make them blossom as the rose. Within the last few years private capital has accomplished a great deal, and now Uncle Sam, with his limitless wealth, will complete the work. The opening of the Crow reservation will open the eyes of the East to the fact that right here, at their very doors, lies a region of undeveloped resources that will in the course of time become the stronghold of the nation. The towns that a few years ago were frontier trading posts are beginning to live up to the possibilities of the section, and are putting on eastern airs and graces. In Billings, the trading center of a section half as big as Missouri, new hotels have sprung up, new

stores with eastern ideas are winning trade, new industrial enterprises that a few years ago would have been laughed down as the vagaries of a scheming promoter, are gaining ready support. Everywhere is the spirit of progress, and the homeseeker will come from the quiet East into a country bristling with enterprise and eager to get ahead. While the ceded strip is only a small part

water at the time of entry and was of little value until the first ditch was built. The land is easily worth \$75 per acre now. Mr. Lamey says that a man may now purchase land near Billings and, on the basis of 160-acre holdings, can easily earn enough to pay from \$1,500 to \$2,000 a year on purchase price or put it in improvements or reinvest it in other land. On the as-



Stacking Hay on the Reservation.

of the great reservation, the influx of settlers is bound to have an effect on legislation, and the rest of the land will not long be withheld from settlement."

Speaking of Billings and vicinity, Mr. Daniel Lamey, a pioneer of that section, says that no man who wants work need go without it in Montana.

Mr. Lamey has a ranch three and one-half miles west of Billings. He is living on a quarter-section

sumption that a quarter section of land with water right costs \$11,000, a man may, provided he can make a reasonable payment down, clear off the whole cost in from seven to nine years, and at the same time make a good, comfortable living for himself and family. In other words, a man is almost certain of being independent at the end of from seven to ten years. Mr. Lamey reached Billings the year before the Northern Pacific Railway



Harvest in Western Montana.

(homestead), which he filed on twenty-four years ago, and has raised and properly educated a family of four children. A hale and hearty man is Lamey, who has secured success by close application and hard work. The government land on which he located was without

was built through that section. Today he is easily worth \$25,000. In the early days he rode a cayuse seven miles to work, making a ride of fourteen miles every day. His wages were \$1.00 per day, so that it may be seen that economy was necessary to secure a start.

THE GREAT FLATHEAD RESERVATION IN MONTANA AND ITS FUTURE POSSIBILITIES.

BY MAJOR W. H. SMEAD, MISSOULA, MONT.
Formerly U. S. Indian Agent in Charge.

Fifty years ago the country embraced within the present boundaries of Montana was a part of the territory of Oregon. It was then the home of the Indian, and he held undisputed sway. However, the early trail blazers were beginning to dot the vast wilderness with their little settlements and the Government, being desirous of negotiating with the various Indian tribes and securing their friendly disposition toward the new settlers in the West, in the year 1855 delegated Isaac L. Stevens, then Governor of the Territory of Oregon, to

sagacity. They chose well—that great scope of country nearly forty by sixty miles in extent, larger than the State of Delaware by more than 200,000 acres, is a great inland empire of broad valleys, large rivers and lakes, great forests, and magnificent mountains, by which it is nearly surrounded. It is a country of marvelous natural richness. Its broad valleys abounded in game, supplying both food and clothing for its occupants. The streams and lakes were full of fish, the timber on the mountains and along the rivers furnished handy fuel. In the valleys and on the prairies the grass was waist high and supplied feed summer and winter in this mild and equitable climate, for the large herds of ponies—the riches of these tribes.

Here for fifty years the Indians have since lived, fond of their country and proud of their vast domain.



Celebrating the Fourth of July.

meet the Indians in council and, if possible, to negotiate a treaty with them. Accordingly, in the month of July of that year the chiefs and headmen of the various tribes living west of the mountains—the Flatheads, Pend d'Oreilles, Kootenais—met in council with Governor Stevens for the purpose of discussing this subject. The meeting took place at a point known as Hell Gate, about six miles west of the present site of the city of Missoula. Here, after many days and much deliberation, a treaty was finally made and signed by Governor Stevens, in behalf of the United States, and the chiefs and headmen representing the various tribes then living in what is now known as Western Montana.

The Indians in making this treaty, and particularly in the selection of their reservation, showed great

No thought had they that at some nearby day they must turn over their country to the whites. The commissions sent by the Government, asking for a cession of a part of their lands, had always met a cold reception. The Indians did not wish to sell the land of their forefathers and their homes. But, alas for poor Lo—the decision of the Supreme Court of the United States in the now famous Lone Wolf case placed a different aspect on the dealings of the Government with Indian tribes. Heretofore it had been the custom of the Government to treat with Indians and secure their consent to the sale or cession of their lands, but the Supreme Court declared that Indians were wards of the Government, and that Congress might legally legislate as it thought best for their welfare. If the Indians had

more land than was necessary for their use, Congress might provide for a sale of the surplus. That is exactly what was done in the case of the Flatheads. On April 23, 1904, the President approved a bill that had passed Congress providing for the surveying of the Flathead reservation, allotting to the Indians each an eighty-acre tract, and the classification, appraisal and disposal of the remaining lands, such lands to be subject to entry under the Homestead laws of the

grown and where there is a good home demand for all that can be produced.

Montana is annually compelled to import from other States more than six million dollars' worth of agricultural, horticultural, meat, poultry and dairy products that could and should be produced within her own borders—the need of more farmers is evident.

The country is splendidly watered. It has many large valleys and numerous smaller ones. Their cli-



On the Flathead.

United States. Accordingly, by direction of Congress, the reservation will be opened to settlement as soon as the preliminary work can be completed. This will throw open to settlement one of the largest unoccupied tracts of land in the United States. Here in Western Montana in the heart of a great and highly developed country—with one great trans-continental railway (the Northern Pacific) crossing it from east to west—with the Great Northern forty miles to the north at Kalispell and connected with steamboat line—with the survey of another railroad from north to south and abundant assurances that it will be built—within seventeen miles of Missoula, a city of 10,000 people and the educational center of the State, is located this favored country—the great Flathead reservation.

matic conditions are quite similar, the mean elevation of the valleys being about 3,000 feet above sea level. Some of the valleys are sandy, gravelly soil, while others are of a heavy loam, but all highly productive when put under cultivation. The sandy, gravelly soils require irrigation. Those of loam require less irrigation, and in some sections, particularly where there is a hardpan subsoil, none at all is necessary. The latter is also true of much of the land along the creek bottoms. Probably one-half of the farming land of the reservation requires no irrigation. The general agricultural and horticultural possibilities of the reservation are similar to those of the farming sections of Missoula and Flathead counties, which adjoin on either side, and where results have been obtained that excel those of



Cattle Roundup on the Reservation.

Here, new, cheap and fertile lands may be had in a country where all conditions combine to make the chances of success in life many times greater than in the overcrowded East, a country where there is a fine, mild climate, where the lands are rich and productive, where all kinds of grains and fruits can be successfully

nearly every other section of the Union. If there be any advantage in either section, that advantage is with the reservation. It is an absolute certainty that any products of the adjoining counties can be equally as successfully produced there.

The Flathead reservation has an almost ideal cli-

mate. During the winter of 1903 and 1904 the zero point was reached but twice and the cold was of but few days' duration. The winter preceding was equally as mild. Little snow falls in the valleys and sleighing for more than a day or two at a time is almost unknown. When there is a fall of snow it is usually carried away by a Chinook wind. This is a warm southwestern wind from the Pacific, and a large fall of snow will oftentimes disappear during a night from its influence. Higher up in the mountains, however, there is a heavy snowfall. These majestic ranges are white from early fall until late the following summer, and on some of the higher peaks the snow never disappears, and can be seen shining brightly during the hottest days of summer. This is a wise provision of nature, for by this snow are numerous little mountain streams fed, and they in turn feed the larger ones that supply the rancher with an abundance of water for the crops. There is frequently a cold spell of three or four days' duration in November, after which the weather moderates and is often and in fact is usually warm and fine until the middle of December and frequently until the first of the year.

During January there is often cold weather. At rare intervals the thermometer will reach below zero. February is often stormy, but some years open and pleasant, and during this month plowing is often done. March is an uncertain month, but farming operations are generally under full headway toward the last of the month. Thus is the short winter ended. The summers are perfect. While it is quite warm during the day, the nights are always cool and refreshing. There are no sleepless nights on account of the heat. June is the rainy month of the year. This is fortunate, as crops at this period need the rain and the days of warm sunshine that follow.

Such a mild climate in this northern latitude may seem impossible to the stranger. It must, however, be borne in mind that the great mountain ranges and the trade winds from the Pacific, which prevail here to an extent, modify and change the conditions, and our climate is consequently much milder than the climate of a prairie State of the same northern latitude.

These mild climatic conditions in connection with the equally favorable range conditions make the Flathead an exceedingly favorable locality for the raising of live stock. Some of the full bloods and many of the mixed bloods have accumulated fortunes during the past ten years raising cattle. Were it not for the large number of ponies of an inferior grade ranging upon the reservation, it would be an ideal stock country. These little ponies are very destructive to ranges, and considering their numbers, they have, during the past few years, been a heavy tax upon the ranges. With the opening of the reservation these herds of Indian ponies will necessarily be disposed of. The Indians from the earliest times have always looked upon their horses as their riches, the number of head, regardless of size of grade, being the basis of their calculations, and for this reason they have been loath to part with them.

The pure, dry air makes the most healthful conditions prevail. There are practically no contagious diseases. For persons suffering from asthma, hay fever, and consumption there are few better places, certainly not for asthma and hay fever. For consumption the outdoor life is best. Camping in the mountains, sleeping on the dry earth, breathing the fragrance of the

pinus, climbing the mountains, fishing and shooting and eating the wild game will give back health.

On the western part of the reservation there are a number of hot springs, which are visited by many white people during the year. They are very beneficial to those suffering from rheumatism and often effect cures quite remarkable. The drinking of this water is very helpful for all stomach diseases.

Mere words can not adequately describe the varied and wonderful scenery to be found here. It has been well called the Switzerland of America. A gentleman who has traveled extensively in foreign lands truthfully remarked that thousands of people annually cross the Atlantic to see that which is inferior in every way to what can be seen any day on this beautiful reservation. The Mission range is remarkable for its high snow capped mountain peaks, rugged and precipitous sides and deep gorges, so inaccessible that only a mountain lion or moccasined foot of an Indian has ever succeeded in reaching them. Streams fed by the everlasting snows plunge over ragged mountain ledges, feeding crystal lakes which lie nestled in the dark forests at their feet.

The greatest lake, the Flathead, lies one-half within the lines of the reservation. It is thirty miles long and from eight to sixteen miles wide, and is a most beautiful sheet of water. It is so clear that the great speckled beauties that live in its depths may be seen scores of feet below the surface. Surrounded by great forests and rugged mountain chains, dotted with its many emerald islands, it is indeed a panorama of beauty near which one might well wish to pass his life, close to nature and its ever present scenes of grandeur.

Other lakes, smaller, but none the less beautiful, are numerous. Lake McDonald, at the foot of a peak of the same name, with an elevation of 10,400 feet, is perhaps unexcelled for beauty and grandeur anywhere in the West. St. Mary's, lying near the divide between the Mission and Jocko Rivers, is scarcely less beautiful. There are others high among the mountains whose waters are ice cold the year round. In some of these, even at great elevations, brook trout are found in great abundance. There are probably at least 100 lakes on the reservation.

In the spring and early summer thousands of bright colored flowers literally cover the valleys and foothills. Here the wild syringa grows in great profusion, and its odors perfume the very atmosphere. The wild rose and dog tooth violets add their beauty and fragrance to Nature's charms.

To the miner and prospector these mountain ranges offer many golden opportunities. Prospecting has been prohibited on the reservation by the Government and the Indians have with jealous care helped to enforce the order, well knowing that if the hidden treasures of those old mountains were found by the white man it would not be long until he would have possession of their country. There is good reason to believe that there are valuable mines on the reservation. Many specimens of high grade ore have been found there, and with the opening, when prospectors will be allowed to search for the ledges, it is believed that mines of great value will be located.

The Pend d'Oreille River drains Flathead lake. Not far from where the lake empties into the river a succession of rapids and falls begin which extends for nearly four miles, furnishing one of the greatest opportunities for developing an immense water power to be

found in the West. Not many years hence this great natural power will be harnessed and will supply power for some flourishing city that will spring up on the reservation. There is enough power in these rapids and falls to supply all of Western Montana.

It is probable that there is not less than one-half million acres of good farming land on the reservation and a large amount of upland and grazing land that may prove valuable when placed under cultivation. From the above the Indians, numbering about 2,000, will be allotted eighty acres each. This will require 160,000 acres, leaving unappropriated 340,000 acres of choice lands for location.

It has often been asked if the Indians will not select the choicest of these lands. The answer seems to be that this will not necessarily be the case. The In-

climatic conditions, make this an ideal spot for camping, hunting and fishing. The beauty and grandeur of the scenery is unsurpassed in the West. No more lovely country than this can be found, and it will become the favorite resort of the tourist and pleasure seeker.

It is a land of plenty. Providence has been lavish in her gifts to this favored section. No wonder the Indians have so long guarded in fear and trembling the lands of their forefathers and of their birth. The ruthless progress of white civilization has finally demanded its surrender, and the land of the Indian will soon be the land of the white man. Marvel not that the red man is loath to share his lands with his white brother. This to him the fairest, the dearest, the brightest of earth, the last remnant of his former greatness, will soon pass from him. So must it be.



Irrigation Scenes in the West—Sheaves of Wheat on the Brady Ranch, Five Miles South of Delta, Colorado; Uncompahgre Project.

dians will have an opportunity of selecting their allotments from any lands not appropriated, but it must be borne in mind that many of them have already located and fenced their farms. Many of these farms are not on the best part of the reservation, nor of the best lands. They will ask to have their fenced tracts allotted to them. The Indians, it is safe to say, in taking their allotments, will not in general secure above the average of the lands of the farming section. There are probably 150,000 acres of timber lands, 300,000 mountain and 450,000 grazing lands.

Flathead reservation will, when opened to settlement, furnish land for thousands of settlers where by labor, industry and thrift happy and prosperous homes will be built. Great mines will be opened up, adding their quota to the world's wealth. Smelters will be erected to reduce the ores. Sawmills will cut the virgin forests into lumber. Flouring mills will be required to grind the wheat. Cities will spring up to handle the business of this new country, and railroads will be built to haul its products to market. Steamers will ply over the great Flathead lake, and on its shores summer homes and health resorts will be built. The abundance of fish and game, together with the perfect

BOOST FOR BOISE.

The Salt Lake *Tribune* of a recent date has the following to say of Colonel Maxson, secretary of the National Irrigation Congress:

"Col. and Mrs. H. B. Maxson, of Reno, Nev., are visitors in Salt Lake for a few days, guests at the Kenyon. They came in yesterday morning from Los Angeles, where Colonel Maxson has been recuperating after a long and serious illness. He was seriously injured in a runaway accident last fall and, after lying for weeks in a plaster cast, was taken to southern California. Colonel Maxson finds the climate of Utah a little too rigorous just now to suit him, and so he will return to California at once.

"Extended preparations for the Irrigation Congress at Boise next fall are reported by Colonel Maxson, who is secretary of the Congress. "Boost for Boise" is his slogan just now, and he predicts that the convention to be held there will be a great one."

Send \$2.50 for The Irrigation Age one year and The Primer of Irrigation, 300 page book.

THE AMERICAN IRRIGATION FEDERATION.

Representatives from Many States Met at Omaha and Formed an Organization.

Declaration of Principles.

After a conference of a number of friends of irrigation and western development living in affected districts and manufacturing centers, a call was issued to effect an organization. As a result men of national repute gathered at Omaha Wednesday, January 10, and formed the American Irrigation Federation, embracing the following doctrines of faith:

pling it with the most desirable, intelligent and progressive citizenship possible to obtain.

Seventh—To fearlessly criticise the reclamation officials, or private promoters, should they offend our sense of justice.

Eighth—To aid in adjustment of freight rates to and from the new areas and to recommend the establishment of mills and factories where needed.

Ninth—To accomplish by criticism and suggestion increased efficiency and perfection of the national irrigation act.

Tenth—To invite friendly discussion and earnest co-operation in efforts to perfect the reclamation service



Irrigation Scenes in the West—In the Uncompahgre District, in Northwestern Colorado, Where a Tunnel Six Miles Long Is Being Built to Carry the Water from the Gunnison River—Note the heavy crop of Alfalfa, the Result of Irrigation.

First—To endeavor to harmonize conflicting interests.

Second—To counsel with federal authorities and private enterprise relative to determining their respective priorities and privileges.

Third—To promote essential legislation, propose laws to encourage irrigation development and to perfect those already on the statutes.

Fourth—To circulate instructive irrigation literature and exploit best methods of irrigation farming.

Fifth—To aid in settlement of the newly reclaimed areas.

Sixth—To accomplish as quickly as possible the reclamation of the greatest available acreage and peo-

and prevent errors and waste that must eventually be borne by water users.

Eleventh—To preserve the rights of the pioneers of irrigation against unjust aggression and confiscation.

This organization marks an epoch in the history of irrigation development, as it is resultant from the deliberation of many of the best authorities and business men of the country. Recent events, it is said, have made manifest the necessity of a federation that will stand for all that is needed to promote the interests of the greater West; one that will neither hamper federal work nor exclude legitimate private enterprise, yet have the courage to criticise errors, no matter from whence they originate; one that will labor in harmony with that

one institution which is the expression and sentiment of practical irrigators—the National Irrigation Congress.

Representatives from the following states were in attendance: Oregon, Washington, Idaho, California, Utah, Wyoming, Montana, Kansas, Colorado, New Mexico, Texas, Arizona, Illinois, Wisconsin, Minnesota, Michigan and Nebraska.

The following officers were elected, to serve until the first annual meeting, which will be held at Boise, Idaho, the date to be determined by the executive committee, to correspond with dates selected for the National Irrigation Congress:

President—Ex-Governor L. Bradford Prince, Santa Fe, N. M.

Secretary—D. H. Anderson, Chicago, Ill.

The members of the American Irrigation Federation will work in every way to support the National Irrigation Congress, and hope to be of material assistance to that organization in the way of carrying out reforms in national as well as private irrigation projects. Due notice will be given all members as to exact date of first annual meeting. All those desirous of joining this federation are requested to send their names to the secretary American Irrigation Federation, 1208 Boyce building, Chicago.

**Send \$2.50 for The Irrigation Age
1 year, and The Primer of Irrigation**



Irrigation Scenes in the West—Pelton's Lake, Spring Creek Mesa, Three and a Half Miles from Montrose—Uncompahgre Project in Colorado.

Executive Committee—G. L. Shumway, Scotts Bluff, Neb., chairman; C. G. Rowley, Jackson, Mich.; John M. McAlpine, Duluth, Minn.; Zera Snow, Portland, Ore.; C. M. Heintze, Los Angeles, Cal.; ex-Governor Frank Hunt, Boise, Idaho; Lucius M. Wilcox, Denver, Colo.

Vice-Presidents—Tom Richardson, Portland, Ore.; Judge Cyrus Happy, Spokane, Wash.; C. E. Brainard, Payette, Idaho; A. H. Heber, Los Angeles, Cal.; Clarence T. Johnson, Cheyenne, Wyo.; Prof. O. V. P. Stout, Lincoln, Neb.; Lucius Wilcox, Denver, Colo.; J. Turley Farmington, N. M.; C. D. Reppy, Florence, Ariz.; Prof. F. D. Coburn, Topeka, Kas.; William Hale Thompson, Chicago; John McAlpine, Duluth, Minn.; A. J. Cobban, Rhinelander, Wis.; John Hall, Lanpassas springs, Texas.

It is expected that a membership of many thousands may be secured by the time for holding the first annual meeting at Boise, Idaho. This meeting will take place at the time of the annual meeting of the National Irrigation Congress, the date for which has not been fully decided upon.

NOTES.

The *Denver Field and Farm* of January 20th contains the following, which may be of interest to some of our readers:

Hot-air Maxwell has finally come out flat-footed as a lobbyist—the very thing for which he has been under suspicion for years—and is in Washington trying to secure an appropriation of \$2,000,000 from the government reclamation fund for use in Oklahoma. The \$2,000,000, as a first sum, is to be used as an entering wedge for \$10,000,000 as fast as the work can be done. It is estimated that it would make available for intensive farming about 400,000 acres of land now absolutely worthless, except for occasional grazing. The amount of plunder and graft behind a scheme like this is something terrible to contemplate and no one knows just how many big fellows are in it.

A horse on straight alfalfa will keep fat on light work, while on straight timothy he will get thin with no work.

THE CAMPBELL SYSTEM OF SOIL CULTURE: WHAT IS IT?

BY H. W. CAMPBELL, BETHANY, NEBRASKA.

The so-called Campbell system of soil culture, that is attracting such widespread attention throughout western Kansas, Nebraska, eastern Colorado and the Panhandle of Texas because of the marvelous results in wheat, corn, potatoes, sugar beets and fruit trees that were grown by this system during the past six years, and especially the increased acreage of 1904-5, have now assumed the proportions of something more than a mere pet theory.

Railway companies who operate lines traversing the above territory now recognize and acknowledge that it has been the principal factor in a vast increase of tonnage and bringing in hundreds of new families who are building up ideal and prosperous farm homes.

Although any of these railroad companies would have gladly endorsed scientific soil culture twelve years ago, when we first began appealing to them and the farmers, they, like the farmers, were skeptical.

Right here let me call attention to some facts we have just obtained from the superintendents of the reform schools in Kansas, Nebraska and Iowa, and that is, that less than ten out of over one thousand boys confined in these institutions in these three States come from the farm direct. Is not this alone sufficient cause to render most sincere thanks to God for the means that shall not only bring a few families from the city, but shall encourage many young men to remain upon the farm?

Did it ever occur to you that the building of new houses and barns upon the farm and the buying of better stock, new buggies, pianos, carpets, books, pictures, in short, all that goes to make the farm home pleasant and attractive, and the farmer and his family happy and contented, depended entirely upon the yield of your cultivated fields? Then is there any one thing that means more to the farmer and his family, to every branch of business from the peanut stand on the corner to the International Harvester Co., than such an advanced knowledge of the general principles of soil culture as shall enable every farmer to accomplish what a few have already done.



A Country Home.

While they have waited they have watched; seeing is believing.

As we ride over these different railroads today through this territory and note the vast improvement of the many old towns, in their streets, sidewalks and buildings, as well as new and more substantial business blocks, we know there is but one cause for it, and that is the greatly increased prosperity of the farmers in the surrounding country. Then as we speed on we note the cheering, stimulating change in the country by an increased acreage of these fertile prairies under cultivation, more young trees and orchards, as well as many new and substantial farm houses. Nothing affords us greater pleasure than to note the firm step of these farmers and their expression of countenance, indicating faith in the country and high hopes for an ideal farm home in the very near future. In observing all this we were frequently constrained to say "God bless these farmers." They will never know the woes and sorrows of their predecessors, who know nothing about scientific soil culture, and again we appeal for blessings upon these farmers (many of whom we know have come from the large cities). Their children will never know the sorrows of the slums of the great cities.

A farmer on the high level prairie of western Nebraska, near Trenton, in Hitchcock County, in 1904, when 90 per cent of a large acreage of wheat was a total failure, and the best yield in the county was a field adjoining this farm and only yielded ten bushels per acre, and yet this field handled by the Campbell system, and without any irrigation, yielded forty-one bushels of sixty-pound wheat per acre, 1,640 bushels from forty acres.

The Pomcroy model farm at Hill City, Graham County, Kas., the same year harvested wheat that yielded forty and a half bushels when adjoining land that was even considered better was not worth the cutting.

A banker at Grainfield, Kas., who hired all his work done, prepared sixty acres of ground under this system in 1903 and harvested in 1904 enough wheat so that he was able from its proceeds to pay all expense of preparation, harvesting, threshing and marketing and had left as a net profit \$16 per acre, or \$960, just 10 per cent on a valuation of \$160 per acre, and this away out in western Kansas, when many failed entirely.

At Walsenberg, Colo., at an altitude of 6,800 feet, forty bushels of corn per acre was grown by this system in 1904 and 1905.

Many similar yields of corn are reported in Colorado at altitudes ranging from 4,800 to 6,000 feet. This refutes some of the old accepted theories.

What is true of corn in the higher altitudes in Nebraska, Kansas and Colorado is also largely true in the northern States or sections of a lower altitude.

These very marked yields are the direct result of a better knowledge of how to till the soil. Later experiments along this same line point clearly, not only to even greater results, but to the fact that man, through a higher and more scientific knowledge of the soil and how to cultivate it, can guard against any possible failure by drouth, even where the average rainfall is not more than 12 to 15 inches, and this without any artificial irrigation.

You, who are not familiar with these facts, do not say impossible, but rather investigate. These general principles mean much to every farming community of North America, but are vital to the more arid sections. Scientific soil culture is the stepping stone to a higher plane of general prosperity and the one thing above all others that will prevent any serious financial depression throughout the great West.

WHAT THEY SAY ABOUT "THE PRIMER OF IRRIGATION."

We have received the *Primer of Irrigation*, a book edited and published by D. H. Anderson, editor of the *IRRIGATION AGE*. The author of this book has been for many years well known by people interested in irrigation. He has not only been the editor of a paper devoted to irrigation, but has been very prominent in national conventions, and his opinions have been widely sought. This book is issued for the purpose of instructing those just entering upon the work of irrigation farming. It is divided into twenty-two chapters, each of which is interesting and valuable reading. He discusses the formation of the soil in general and considers the questions of fertility and sterility. He pays particular attention to semi-arid and arid lands, explains what alkali soils are and prescribes a treatment. His chapter on relations of the water to the soil is one that can be read with profit by any man, whether interested in irrigation farming or in farming in humid regions. His chapter on laying out of land for irrigation purposes is well worth the price of the book. Another chapter shows that irrigation is both a science and an art. The important question of seepage of irrigation waters is fully considered. In two other chapters he treats of sub-irrigation and supplementary irrigation. Every farmer that uses pumps or irrigation machinery should read chapter XIX of this book. In detail he considers irrigation in relation to the growing of cereal crops and the use of water in irrigation whether in orchards, vineyards or small fruit plantations. The book is bound in cloth and contains 257 pages. The price of the book is \$2.00. The book may be had of the D. H. Anderson Publishing Co., 112 Dearborn street, Chicago.—*The Farmers' Review*, Chicago.

Primer of Irrigation.

A very valuable work on the subject of irrigation has been published by the D. H. Anderson Publishing Company, publishers of the *IRRIGATION AGE*, Chicago, Ill. The book is entitled "Primer of Irrigation," and

the author is D. H. Anderson, who is well known to the implement trade. It is a book of about 250 pages, fully illustrated, and the title gives a good idea of the manner in which the subject is treated. The greater part of the book originally appeared in installments in the columns of the *IRRIGATION AGE* and attracted widespread comment and a demand for its publication in book form. To those who are interested in the subject of irrigation, whether as amateurs or professionals, the book is a most valuable aid.—*The Implement Age*, Philadelphia.



CORRESPONDENCE



LOVINGTON, ILL., Jan. 12, 1906.

IRRIGATION AGE, Chicago, Ill.:

Dear Sirs—I desire some drainage information, and I understand there is some data on the matters I desire to inform myself concerning. I desire to drain some land nearly level. I can not do it in the ordinary way unless I could get those below me to drain for some miles, which is not possible. The land is situated in a section of country where wells can be sunk as for irrigating rice and seem to be inexhaustible. It is current talk that a well that can not be exhausted can not be filled up by pouring water into it. My plan is to sink some wells to the underground lake, river, or reservoir, by whatever name called, and tile or ditch into it, taking care to filter so as to keep from clogging up well.

I want all the information I can get on the above proposition, with as full statement as I can get as to the conditions trial was made, the difficulties, successes, failures, etc., so that I may not spend time or money demonstrating what I might have known. Enclose find stamps for reply.

Yours truly,

A. J. MYERS.

WELL PLEASED WITH IRRIGATION AGE.

ALBION, IDAHO, Jan. 1, 1906.

THE D. H. ANDERSON PUBLISHING CO., Chicago, Ill.:

Gentlemen—I enclose you \$1.00 for my renewal of *THE IRRIGATION AGE* for the year 1906.

During the past twelve months I have received your magazine promptly each and every month. The contents were not only interesting but practical, and of great value to every one interested in irrigation, and the reclamation of the arid West. I am glad to see your articles relating to the cost of settling land under the various canals. These articles should be of great benefit to the persons who contemplate settling in the "Great West" where "irrigation is king."

Give us the progressive eastern farmer, teach him the value of water and the use of the shovel and the "Land of Opportunity" will develop rapidly. But please keep the man with the "hammer" at home. We have knockers enough. "Don't knock, but boost." Yours for success.

G. M. DEWEY.

VENEERED TREE PROTECTORS.

Our readers will notice an advertisement of the Hart Pioneer Nurseries, of Fort Scott, Kas., in this issue, calling attention to their veneered tree protectors.

We have seen a sample of these protectors, and judging from the high-class testimonials that this firm furnished they evidently are a good thing, and will do all they claim of them, such as protecting the trees from mice, borers, rabbits, hot winds, etc.

We notice testimonials from some of the largest orchardists and secretaries of many horticultural societies, advocating the protectors.

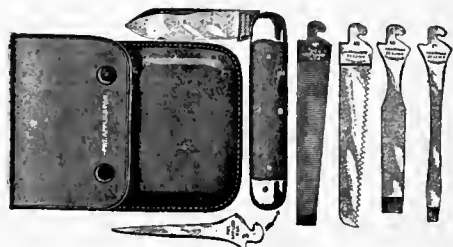
If any of our readers have orchards to protect they will do well to correspond with the above firm and get their circulars and samples.

POCKET KNIFE TOOL KIT FREE.

We are showing herewith the "Napanoch" pocket knife tool kit, the latest thing in a serviceable novelty which we have been able to secure, and it will be noted may be firmly attached to the pocket knife as indicated by arrow in one second by a simple backward wrist movement, and is quickly removed by a forward wrist movement. This tool kit is more useful than any other pocket knife combination ever made. It is made by skilled workmen and of the best material, and is sold with an unlimited warranty.

The cut shows:

No. 1—A fine leather pocketbook, $4\frac{1}{2}$ inches long by $3\frac{3}{4}$ inches wide, $\frac{3}{4}$ inch thick, containing all of the



tools illustrated, making a convenient case easily carried in the pocket.

No. 2—Pocket knife, length $3\frac{7}{8}$ inches.

No. 3—Reamer, length $3\frac{1}{8}$ inches.

No. 4—File, 4 inches.

No. 5—Saw, 4 inches.

No. 6—Chisel, $3\frac{5}{8}$ inches.

No. 7—Screw driver, $3\frac{3}{4}$ inches.

This is a very serviceable tool for a boy or young man and is a handy tool about the house, and can be handled by any one. The selling price of this tool is \$2.25 each, but in order to give the young members of the family of the readers of the IRRIGATION AGE an opportunity to secure it we will make the following offers:

To those securing one yearly subscription and mailing us \$1.00 for same, that being the regular yearly price, and an additional \$1.25, making \$2.25 in all, we will ship this complete outfit, postage paid.

To those securing two subscriptions at \$1.00 each and sending \$1.00 additional an outfit will be sent.

To those sending three subscriptions at \$1.00 each and 75 cents additional.

Four subscriptions at \$1.00 each and 50 cents additional.

Five subscriptions at \$1.00 each and 25 cents additional.

Those sending six subscriptions at \$1.00 each the outfit will be sent free, postage paid. Send for sample copy and subscription blanks to THE IRRIGATION AGE, 112 Dearborn street, Chicago, Ill.

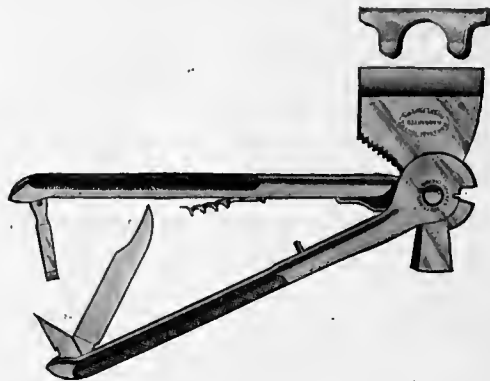
Send \$2.50 for The Irrigation Age
1 year, and the Primer of Irrigation

AN ATTRACTIVE GIFT.

We are showing herewith an all around tool, which would be serviceable in any household. By examination of the illustration it will be seen that this tool discloses twelve different combination, as follows:

Hatchet, hammer, wire cutter, wire splicer, pinchers, alligator wrench, leather punch, corkscrew, nail claw, hunter's knife, can opener and screwdriver; all of which are convenient and practical tools, ever ready at hand for immediate use in any emergency, in which event they are especially valuable.

This aggregation of twelve different tools as shown in illustration, if bought separately in any retail hardware store, would cost in the neighborhood of \$7.00. We



will be glad to furnish these tools to any of our readers for \$3.50, charges prepaid, or we will send one of these tools, charges prepaid, to our readers sending us a club of ten new subscribers to the IRRIGATION AGE at \$1.00. It will be seen that by securing ten subscriptions to the IRRIGATION AGE and remitting same to us that you may secure a combination of twelve tools which could not be purchased for less than \$6.00 or \$7.00.

We will guarantee this tool to be of best workmanship and will replace any that show defects.

If You Like The Irrigation Age Why Not Send it to a Friend

FOR ONE YEAR?

Cannot fail to please any man and will please him for twelve months
Fill in address and mail with One Dollar at our risk
If you wish to send "PRIMER OF IRRIGATION" also, send \$2.50

THE IRRIGATION AGE,

112 Dearborn Street, Chicago

Send your Magazine one year, commencing with the

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paid for and is sent with the compliments of.....

THE NORTHERN HOTEL, Billings, Montana

The leading hotel of the Queen City of the Yellowstone Country. Steam heated, electric lighted; headquarters for tourists, irrigation men and all who enjoy good service. A. F. McNABB, Manager.

TUBERCULOSIS and CATARRH can be cured if taken in time by using **Norwegian Inhalant Powder**. Quick relief. Every case helped. Natural breathing restored. Free from Morphine or Cocaine. Mailed on receipt of \$1.00 by Norwegian Cure Co., Block C., Rochester, N. Y.

Thomas Scott, of Rochester, was pronounced incurable by four physicians and his life was saved by this remedy.

SEEDS FOR ARID SOIL

Should be selected from sections best adapted to reproduce strong, vigorous stock. For irrigated or dry farms, the seeds sold by the Missouri Seed Company will fulfill all expectations as to growth and crop :: ::

Missouri Seed Company's Seeds

are selected expressly for arid sections and include the choicest of the flower field, and garden varieties. They invariably produce bumper crops. Large stock of Alfalfa, Millet, Cane, Kaffir Corn, Potato and Melon Seeds. We also handle Planet, Jr., Garden Tools, Seed Sowers, etc. :: :: :: ::

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Pathfinder Land Company

Scottsbluff, ♪ ♪ ♪ Nebraska

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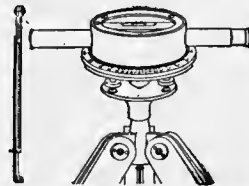
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Write for descriptive circulars of the

BOSTROM IMPROVED FARM AND BUILDERS' LEVELS



Practical up-to-date instruments that anyone can use. Recommended by professional men of repute and by the most progressive farmers of the country for irrigation, drainage and building purposes. Prices: \$10.00 and \$20.00 including Telescope, Tripod and Rod.

BOSTROM-BRADY MFG. CO.

55 W. Alabama St.

ATLANTA, GA.

TREE PROTECTORS

75c. per 100

\$5.00 per 1,000



As valuable in summer against sunscald, hot winds, etc., as they are in winter against cold and rabbits. Recommended by all leading Orchardists and Horticultural Societies. Send for samples and testimonials. Do not wait until rabbits and mice ruin your trees.

WRITE US TO-DAY

Wholesale Nursery Catalogue now ready. Send for copy.

AGENTS WANTED EVERYWHERE

HART PIONEER NURSERIES

FORT SCOTT, KANS., BOX 174

DON'T BUY GASOLINE ENGINES

all one-cylinder engines; revolutionizing gas power. Costs Less to Buy and Less to Run. Quickly, easily started. No vibration. Can be mounted on any wagon at small cost—portable, stationary or traction. Mention this paper, SEND FOR CATALOGUE. THE TEMPLE PUMP CO., Mrs. Meagher & 15th Sts., Chicago. THIS IS OUR FIFTY-SECOND YEAR.

Baby Rambler ROSES

Ever-blooming dwarf. Blooms 365 days in the year, indoors. Out of doors from May until November. Hardier than the Crimson Rambler. Free from insects and fungus. No rose will produce as much bloom. Our nursery catalog tells how to get it FREE, and describes Trees, Shrubs, Roses, Vines and Perennials, hardy in the Northwest. Write. Sioux City Seed & Nursery Co., 217 Clark St., Sioux City, Ia.

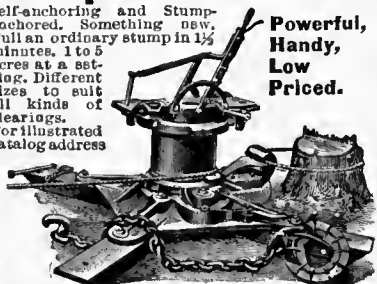
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THAT GROW
Best quality. Good bearers. Low prices. Apple 4c; Plum and Cherry 12c; Peach 4c; all budded; Concord Grapes 2c; Forest Tree Seedlings 1000 up.
GERMAN NURSERIES
Carl Sonderegger, Prop.
Tested seeds very cheap. Freight paid on trees. Catalogue, English or German, free. Write for it today. Address **GERMAN NURSERIES**, Box 52 Beatrice, Neb.

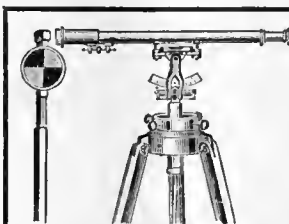
Stump and Tree Pullers

Self-anchoring and Stump-anchored. Something new. Pull an ordinary stump in 1½ minutes. 1 to 5 acres at a setting. Different sizes to suit all kinds of clearings. For illustrated catalog address

**Powerful,
Handy,
Low
Priced.**



Milne Mfg. Co. Ninth St., Monmouth, Ill.



FARM LEVELS, ROAD LEVELS, ARCHITECTS' LEVELS, Etc.

Levels especially designed for Terracing, Ditching, Drainage, Irrigation, Rice Culture, and also for Road Building, Contracting, etc. Levels with all the latest improvements and that are very simple, durable, accurate and easy to adjust and to operate. Prices range from \$5 to \$35, depending on the attachments, size of telescopes, etc. We build the level that will suit your purpose and that will satisfy you in quality and price. Write for our complete catalogue and let us show you their several advantages.

BELYEU LEVEL CO., ALEXANDER CITY, ALA.



Does YOUR Wooden Headgate Leak?

Most wooden gates do. Isn't it possible that next season you may need the water that is now leaking away? Isn't it possible that leak may undermine your wood gate and cause it to wash out, leaving you without a water supply?

It will pay you to put in a strong, reliable, water-tight headgate. A **Northwestern Reservoir Headgate** is strong because made of iron and steel; it will not leak because the slide and frame are planed to an absolutely water-tight bearing.

The value of the water you lose this winter on account of a leaky wooden gate would more than equal the cost of a **Northwestern Headgate**.

I shall be pleased to send you my CATALOGUE.

C. D. BUTCHART, - Denver, Col.

Opportunity

When combined with virgin soil, splendidly adapted to the products which yield the greatest profit, you have a superior climate, excellent water and abundance of it, unsurpassed railroad facilities, good smooth roads and all the advantages of civilization, you have an opportunity that it is difficult to equal in this country today, especially so when you can purchase good land close to an enterprising city of 8,000 for from \$10 per acre upwards on easy terms. While it is true that we are making great progress in this part of Michigan, do not get the idea that there is a "boom" on—our present headway is simply the natural result of our actual advantages, the possibilities of which are just becoming to be recognized. I could fill up several pages telling you facts about these lands I have for sale. I am enthusiastic because I know what this country will do for the industrious man. I believe in it because I *know* it and can prove every statement that I make. Besides thousands of acres that I have sold the past year, the first year these lands were ever offered, I have

20,000 Acres at \$5 per Acre and Upwards

from one-half to six miles from the City of Cadillac which I will sell on reasonable terms to actual settlers who will help me to develop them. I have an illustrated booklet and map giving complete and accurate information which I will be glad to send you free if you will write me. Write me to-day, it will pay you.

SAMUEL S. THORPE

Room 8, Webber-McMullen Building, CADILLAC, MICHIGAN

"The basis of my business is absolute and unvarying integrity."—Samuel S. Thorpe.

Real Estate Dealers and Agents: I want you to co-operate with me. I can make it worth your while to represent me. I pay liberal commissions. A postal card will bring you full particulars in regard to same and my methods of doing business.

Galvanized Steel Irrigation Flumes AND WATER TROUGHS



Galvanized steel is rapidly taking the place of wood for fluming purposes and with The Maginnis Patent splice fluming is made easy. Any boy can put the Maginnis Steel Flume together or take it apart. Steel flumes and troughs "Ship Knock down" Third Class freight. Let me figure on your flume. All flumes guaranteed.

Write for Testimonials and Particulars to

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The Leading Hotel in Idaho



Modern and up-to-date in every particular. Political, Commercial and Social Headquarters of Idaho.

E. W. Schubert, Manager

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From Chicago to

North Pacific Coast Points

**February 15 to April 7
1906**

The opportunity of the year to go West on low One-Way Colonist Excursion rates, applying to Montana, Idaho, Washington, and Oregon Points. Buy a farm in the marvelous irrigated districts where crops are independent of rainfall. For information write C. W. Mott, G. E. A., St. Paul, Minn.

Double daily transcontinental service. Pullman 18-section tourist sleeping cars. Stopovers west of Billings, Mont., except between Logan and Garrison, inclusive. Write at once for full information.

From Chicago to Billings, Mont., \$25; Helena and Butte, \$30; Spokane and Ellensburg, \$30.50; Portland Tacoma, Seattle, Ashland, Ore., and Astoria, Ore., \$33. Ask about low rates to California Points.

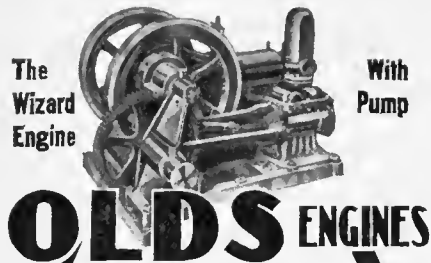


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For Rates Write **A. M. CLELAND, G. P. A.**
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The
Wizard
Engine

With
Pump



OLDS ENGINES

ARE USED BY THE
U. S. GOVERNMENT

In sending out their last specifications for gasoline engines for West Point, the U. S. War Department required them "to be Olds Engines or equal." They excel all others or the U. S. Government would not demand them.

The horizontal type, 2 to 100 H. P., and are so simply and perfectly made that it requires no experience to run them, and

Repairs Practically Cost Nothing.

Send for a catalogue of our Wizard Engine, 2 to 8 H. P. (jump-spark ignition, the same as in the famous Oldsmobile).

The most economical small power engine made; fitted with either pump-jack or direct-connected pump. Or, our general catalogue, showing all sizes.

Olds Gasoline Engine Works,
Lansing, Mich.

Write To-day



Motsinger Auto-Sparker

Starts and Runs

Gas Engines Without Batteries

No other machine can do it successfully for lack of original patents owned by us. No twist motion in our drive. No belt or switch necessary. No batteries whatever, for make and break or jump-spark. Water and dust-proof. Fully guaranteed.

Motsinger Device Mfg. Co. 111 MAIN ST., PENDLETON, IND., U. S. A.

Campbell System OF Soil Culture

is revolutionizing agriculture in the semi-arid regions of the west. With an annual rainfall of 14 inches, crops of all kinds are as certain and as large under the Campbell System as in the Eastern States. It is a system of scientific "dry farming" evolved through 26 years experimenting in the arid regions.

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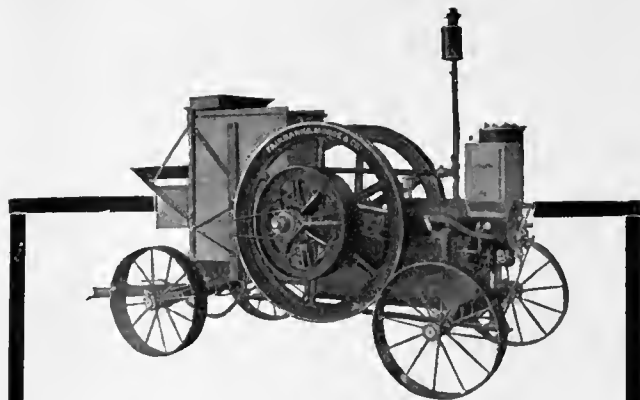
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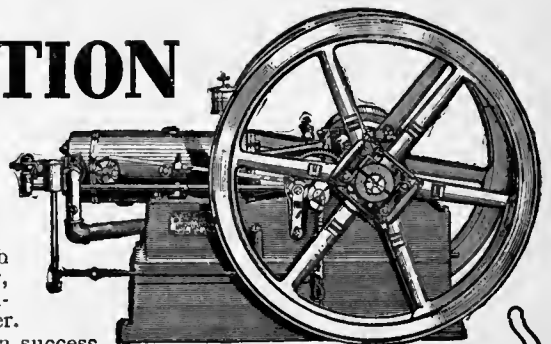
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The difference between success and failure in an irrigation pumping plant is often a question of fuel.

The I. H. C. engines use gasoline—a cheap and easily transported fuel.

They take the least fuel and convert it into the most power.

They are unequalled when put against a steady load as in pumping, and sustain their full rated power with persistency and regularity.

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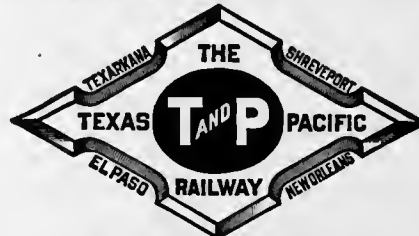
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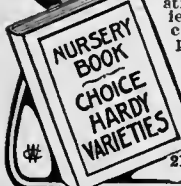
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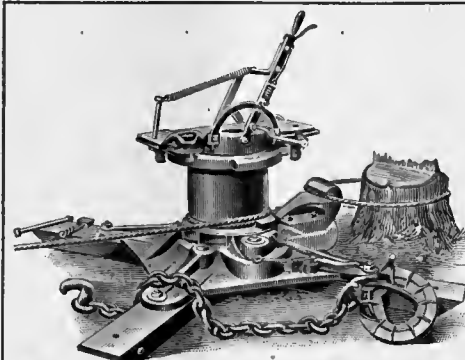


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ON THE AMERICAN CONTINENT TO-DAY
CONSTRUCTED BY THE CANADIAN PACIFIC RAILWAY

IN SOUTHERN ALBERTA, CANADA

The Land That's Famous For Its Tremendous Crops
of Hard Winter Wheat, Alfalfa and Sugar Beets

The Ideal Country for Diversified Farming

This enormous undertaking by the Canadian Pacific Railway will eventually place "under ditch" a million and a half acres of land and will yet take years to complete. It is without doubt the world's greatest irrigated proposition ever undertaken by any government, corporation or persons. The first section of this great project is now placed on the market for the first time, and we have now ready for the farmer

ONE HUNDRED THOUSAND ACRES

Of the best irrigated land in the world lying immediately on the northern side of the Main Line of the Canadian Pacific Ry., at Gleichen and extending back ten miles, all in a solid block.

At from \$18.00 to \$25.00 an Acre

ON EXCEPTIONALLY EASY TERMS

IRRIGATION IS PRACTICAL CROP INSURANCE

You get moisture when needed, where needed and as much as needed.

READ WHAT DR. ELWOOD MEADE, AMERICA'S HIGHEST AUTHORITY ON IRRIGATION; SAYS after careful examination of the entire project: "The soil of the irrigable area is fertile and well adapted to the application of water. The water supply is ample and the rights of the Company thereto are secured."

In the very heart of this so-called Gleichen tract there has been raised this year without irrigation, 45 bushels of Wheat and 80 to 100 bushels of Oats to the acre. What will this land not do with irrigation? We have some attached areas of non-irrigable land which are covered with a splendid growth of grass and are perfect for grazing lands, which we will sell in conjunction with the irrigated land. This will make an ideal combination of irrigated and non-irrigated land for farming and stock raising. As there are comparatively few of these combination farms, it will be well for you to make a selection at once.

Upon application to the undersigned, stating that you want to inspect this land, we will furnish you with a certificate enabling you to buy a ticket over the Canadian Pacific Railway lines from any point at which you wish to start to Gleichen and return, at a rate of one cent a mile from the Eastern and Southern points reached by the Canadian Pacific Railway, and a rate of one fare for the round trip from points on the main line West of Calgary to the coast.

These lands will be placed on sale at merely nominal prices, our object being to establish a great agricultural community rather than to sell these lands at their real value, either as judged by their crop production or the prices of irrigated lands elsewhere. The Canadian Pacific Railway will forever maintain these canals and laterals at the nominal cost of 50c per acre per annum. The terms of sale will be one-quarter cash and the balance in five equal annual instalments at 6 per cent interest. This land will be sold in tracts of 80 acres and as much more as you desire. Remember, first come, first choice.

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IN THE LAND FAMOUS FOR ITS TREMENDOUS CROPS
OF HARD WINTER WHEAT, SUGAR BEETS AND ALFALFA

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WHERE THE
GREATEST IRRIGATION PROJECT
on the American Continent today is being constructed by the
CANADIAN PACIFIC RAILWAY

100,000
ACRES

This enormous undertaking by the Canadian Pacific Railway will eventually place "under ditch" a million and a half acres of land and will take years yet to complete. It is without doubt the world's greatest irrigated proposition ever undertaken by any government, corporation or person. The first section of this great project is now placed on the market for the first time, and we have now ready for the farmer

OVER 100,000 ACRES

of the best irrigated land in the world, lying immediately north of the MAIN LINE OF THE CANADIAN PACIFIC RAILWAY at Gleichen and extending back ten miles in a solid block.

THE CANADIAN PACIFIC RAILWAY
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No Floods

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WE HAVE SOME ATTACHED AREAS OF NON-IRRIGABLE LANDS WHICH ARE COVERED WITH A SPLENDID GROWTH OF GRASS AND PERFECT FOR GRAZING LANDS, WHICH WE WILL SELL IN CONJUNCTION WITH THE IRRIGATED LAND. THIS WILL MAKE AN IDEAL COMBINATION OF IRRIGATED AND NON-IRRIGATED LAND FOR FARMING AND STOCK RAISING, AS THERE ARE COMPARATIVELY FEW OF THESE COMBINATION FARMS, IT WILL BE WELL FOR YOU TO MAKE A SELECTION AT ONCE.

Ample hotel accommodations at Gleichen will provide you comfort, and we will furnish teams and drivers to show you over the tract, free of expense. Upon application to undersigned, stating that you want to inspect this land, we will furnish you with a certificate enabling you to buy a ticket over the Canadian Pacific Railway lines from any point at which you wish to start to Gleichen and return, at a rate of one cent a mile from the Eastern and Southern points reached by the Canadian Pacific Railway, and a rate of one fare for the round trip from points on the main line West of Calgary to the coast.

These lands will be placed on sale at merely nominal prices, our object being to establish a great agricultural community rather than to sell these lands at their real value, either as judged by their crop production or the prices of irrigated lands elsewhere. The terms of sale will be one-quarter cash and the balance in five equal annual installments at 6 per cent interest. This land will be sold in tracts of 80 acres and as much more as you desire. Remember, first come, first choice.

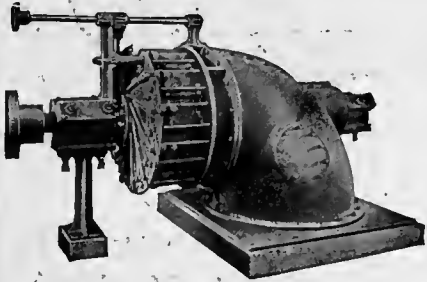
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SAMSON TURBINE

When the PUMP cannot be direct connected to the turbine shaft, the power is usually transmitted by gears, shafting, etc. On account of the HIGH SPEED of the SAMSON, for a given power, lighter and consequently CHEAPER transmission machinery can be used.

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The "Otto" Suction Gas Producer

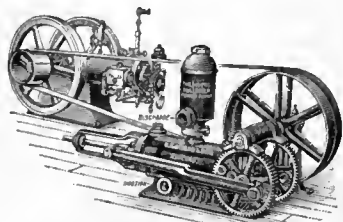
is saving money and making friends wherever installed. In conjunction with the "Otto" Gas Engine it makes the rare combination of reliability and economy. For plants 20 H. P. and up it will pay the biggest kind of a dividend. Discard the worn-out and dangerous boiler for an "Otto" outfit and save money in fuel, insurance, help and repairs. In writing for Catalog tell us your needs in detail. Mention this paper.



OTTO GAS ENGINE WORKS, Phila., Pa.
STANDARD OF THE WORLD

MYERS POWER PUMPS

WITHOUT AN EQUAL ON THE GLOBE



OPERATING
WITH
GAS ENGINE

FIG. 952

HORIZONTAL BULLDOZERS, 3' to 6' CYLINDERS

MYERS
BACK GEARED
WORKING HEAD

TAPPED FOR
3" PIPE

5, 7½ and 10"
STROKE

FOR
BELT, WIND OR
HAND POWER

FIG. 1113

2½" DISCHARGE



BULLDOZER
WORKING
HEAD

PISTON
COUPLING NUT

1½" BRASS ROD

PIPE FLANGE

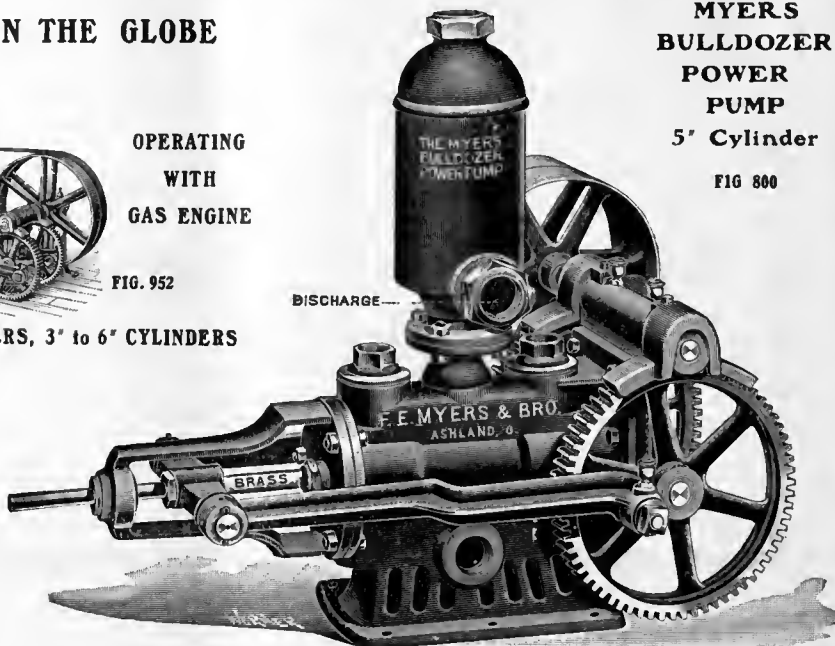


MYERS
BULLDOZER
POWER
PUMP

5' Cylinder

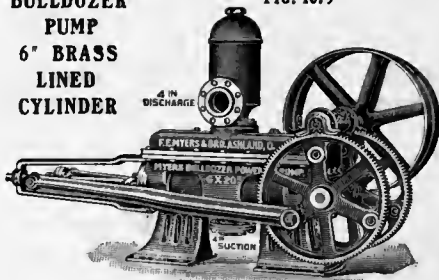
FIG. 800

DISCHARGE



BULLDOZER
PUMP
6" BRASS
LINED
CYLINDER

FIG. 1079



MYERS BULLDOZER
WORKING HEADS

No. 359

5", 7½", 10" STROKE
DISCHARGE, 2½ or 3 INCHES
SUCTION 2 to 4 INCHES

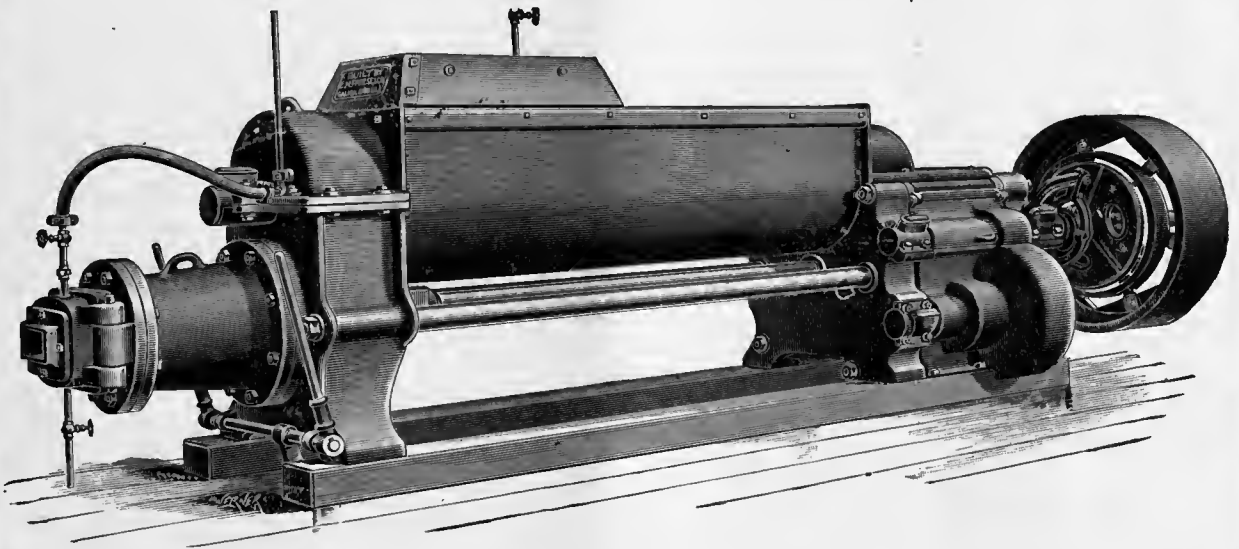
No. 364

12", 16", 20" STROKE
REGULARLY FITTED 4" DIS-
CHARGE
SUCTION 8' OR LESS

Write for Descriptive Circulars and Prices
We want you to acknowledge this Ad. so
that we can acquaint you in detail with the
superior features of **Myers Power
Pumps**. This is the proper season.
The right time to write is right now.

F. E. MYERS & BRO., ASHLAND OHIO, U.S.A.
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FIVE SIZES ALL CAPACITIES

Outfits for Drain Tile, Hollow Ware, Building
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If interested write us for particulars and estimates.

E. M. FREESE & CO.
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ARE YOU READY FOR HARVEST

How about it?

Old Mother Earth, the sun and the showers, the dews and the winds, are doing and will do their part to produce the wheat and the oats and rye and barley that go to make a bountiful harvest.

Are you doing your part?

Are you getting ready to *harvest* the crop after it is grown?

Do you know *how* you will cut your grain?

Are you sure you will harvest it to the best advantage—with the least loss of grain, the least waste of time, the least trouble and worry and expense?

These are mighty important questions, for a large share of your *profit* depends upon them. It's not too early to begin to think about them.

With high priced land and high priced labor, you need to get every cent from every acre you cultivate.

Help will be scarce and expensive; therefore, you need a harvesting machine that will save you the most labor.

Harvest days are few; therefore you need a harvesting machine that will save you the most time.

Grain is worth money; therefore, you need a harvesting machine that will save you the most grain.

You can't afford to run risks.

You can't afford to take chances.

And you don't have to.

Take an hour or two, now, before you get too busy and talk to any agent of the International Harvester Company of America, and find out about the International line of harvesting and haying machines for 1906. You'll be interested whether you buy or not.

* * * *

Buying a machine of any kind for use on the farm is not as simple a matter as it may seem. You can "size up" a farm and know pretty accurately how much an acre you can afford to pay for it, but unless you are a mechanical expert you can't judge a machine in the same manner.

You have to take other things into consideration.

For example:

You need to know something about the design—the mechanical principles—how the machine works.

You need to know something about the materials used in it.

You need to know something about the skill used in its construction.

You need to know something about the responsibility of the man behind it and about the machine's reputation.

The International Harvester Company line of machines for 1906 will satisfy you on these points—and on every other point that you may bring up.

* * * *

Bigness is not necessarily a merit in itself.

If you're buying a horse you don't care very much whether the man who raised it raises one colt a year or 500.

But you know that the man who makes a specialty of horse breeding is more likely to raise a hundred good colts, than is the man who goes at it in a hit-and-miss, haphazard manner.

It's the same way with farm machines.

You don't care whether a manufacturer makes 1,000 or a 100,000 of them, just so the machine satisfies you.

But there's this to take into account.

The first harvesting machine was largely an experiment. For fifty years inventors and manufacturers continued to experiment, making changes and improvements, adding this and taking away that, until finally a half-dozen harvesters began to stand out head and shoulders above the others.

Why do you suppose that was?

HOW did it happen that the Champion, the Deering, the McCormick, the Milwaukee, the Osborne and the Plano increased in popularity and sales so much more rapidly than the hundred and one other harvesting machines that have been put on the market at various times in the past 50 years?

There is only one reason for it.

They met the demands of the farmer, and satisfied his needs.

In the expressive language of the day, "they made good." They're better today than ever before; they do better work and give greater satisfaction. And here are the reasons—

1st.—The mechanical principle is right.

The manufacturers of the Champion, the Deering, the McCormick, the Milwaukee, the Osborne and the Plano, by co-operation are able to include in their respective machines every device, every invention, every mechanical principle yet discovered that tends to make a harvesting machine do better work.

By co-operation they are able to maintain such experimental shops as the world has never seen before, making certain that every improvement and every device that mechanical genius can contrive will be employed in their line.

2nd.—The materials are right.

By co-operation they are able to own, control and operate their lumber camps, their own saw mills, their own coal and iron mines, their own coke ovens, their own steel mills, relieving them of the necessity of depending upon the uncertain and fluctuating steel markets, coal markets, lumber markets, etc., for their raw materials, etc., and insuring them at all times an abundance of materials which they know to be right. These are added reasons for the superiority of these harvesting machines.

3rd.—The workmanship is right.

The demand for these six leading makes of harvesting machines enables their manufacturers to maintain manufacturing plants of the highest efficiency and to employ workmen of the highest skill—factories and workmen which could not by any possibility be maintained to supply a small demand.

4th.—Their reputation is right.

The fact that so many farmers cannot be persuaded to buy any other,—the fact that so many farmers continue to buy them,—the fact that they are considered the standard wherever grain is grown in every part of the world is sufficient indication of their reputation and reliability.

You probably need one of these harvesting machines.

You cannot afford to begin harvest with a machine that is liable to break down and cause you several days' delay.

You cannot afford to use a machine that loses a few stalks now and then and a whole sheaf here and there, for a little leak like that eats in to your profits at a surprising rate.

Go to your dealer now, and get whichever catalogue you want.

If you don't know an International Dealer—write to nearest branch house.

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THE IRRIGATION AGE

VOL. XXI

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No. 5

THE IRRIGATION AGE

With which is Merged
MODERN IRRIGATION THE DRAINAGE JOURNAL
THE IRRIGATION ERA MID-WEST
ARID AMERICA THE FARM HERALD

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G. L. SHUMWAY } Bus. Mgr.

ANNOUNCEMENT.

"The Primer of Irrigation" is now ready for delivery. Price, \$2.00. If ordered in connection with subscription, the price is \$1.50.

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Official organ of the American Irrigation Federation.
Office of the Secretary, 1208 Boyce Building, Chicago.

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It may interest advertisers to know that *The Irrigation Age* is the only publication in the world having an actual paid in advance circulation among individual irrigators and large irrigation corporations. It is read regularly by all interested in this subject and has readers in all parts of the world. *The Irrigation Age* is 21 years old and is the pioneer publication of its class in the world.

Photographs Belle Fourche.

The photographs used in connection with our article on the Belle Fourche project in this issue, were secured through the courtesy of Mr. L. H. Storgaard, staff artist of the *Dakota Farmer*.

Southwest Texas.

We are presenting in this issue an illustrated article on southern Texas, data for which has been secured through the kindness of Mr. Wm. Doherty, general passenger of the Gulf Coast Line, Corpus Christi, Tex. Mr. Doherty is also editor and publisher of that charming little publication called the Gulf Coast Line Magazine.

Pay Your Subscription Bill.

Our readers are herewith respectfully reminded of the fact that a large sum of money is due us for subscription to *THE IRRIGATION AGE*, and those in arrears are requested to send us in draft or money order to balance their account.

Pays Advertisers.

This journal has received many letters recently from advertisers speaking in high terms of the pulling quality of *THE IRRIGATION AGE*. One advertiser who has been carrying a four-inch advertisement in one hundred and sixty standard publications has informed us that *THE IRRIGATION AGE* and *Farm & Ranch* of Dallas,

Texas, have brought a greater number of inquiries than have been received from all the other papers combined. This is a very high compliment and should attract the attention of all who are placing advertising to reach the prosperous farmer.

Twin Falls.

On a recent visit to the West, the editor of *THE IRRIGATION AGE* visited for the second time the far-famed town of Twin Falls, Idaho. At the time of his first visit the land where Twin Falls now stands was virgin desert covered with sage brush. Today, less than two years after the first visit, is to be seen a town of 2,500 inhabitants, with an area of nearly 200,000 acres of land adjacent to it under cultivation, a large part of which produced good crops in the season of 1905.

Where two years ago one could see nothing but sage brush for mile after mile are now neat, substantial farm houses, fenced farms and well worked land.

The great Twin Falls irrigation canal, which will eventually supply nearly 400,000 acres of desert land with water taken from the Snake River, is an object lesson to all who make a study of the reclamation of the arid West.

Twin Falls has a commercial club with a membership of about 150, composed of men who are engaged in commercial pursuits in that city. These men are all wide awake to the future possibilities of that territory and are doing everything possible to promote

the growth of the town and increase the opportunities of the farmers in the territory surrounding it.

A fine new hotel has recently been built and named in honor of Mr. I. B. Perrine, the original promoter of this vast enterprise.

When the writer visited this point the first time, in company with Mr. Perrine, the first bag of mail which was ever delivered at the postoffice was carried over in the stage from Shoshone, twenty-five miles away, and delivered to the then little frame store in which the postoffice was established. During his recent visit there the writer counted over one hundred people waiting in line to secure mail from the postoffice, this mail having been delivered by train over the new branch of the Oregon Short Line, which connects Twin Falls with the main line of that railway at Minidoka.

Between Minidoka and Twin Falls, a distance of some fifty-odd miles, are many thriving towns, some of which have been located on the federal irrigation project known as the Minidoka, and others farther along on the south side of the Snake River which have been built up on the Twin Falls tract.

Longs for Notoriety.

The leader of the National Irrigation Association is a man gifted with great volubility of speech, much self-importance in delivery, considerable occasional violence in manner, and among those who have not heard of him or his methods, he commands considerable attention, rather from the strength of his lungs, however, than from the solidity of his reasoning. Among the many qualities possessed by this individual is an inordinate longing for self-aggrandizement and exploitation of his individualisms. He is prone to publish his own photograph in journals subsidized or controlled by his association. This weakness was emphasized recently by the appearance of a half-tone photo of himself in a "magazine supplement" sent out free to country publishers by a company of which he is the head. The inscription read, "Geo. H. Maxwell, Executive Chairman, The National Irrigation Association." The accompanying matter failed to state that this association had been repudiated recently by the National Irrigation Congress.

Loyal to a Misconception.

The head of the National Irrigation Association is up to his old tricks in attempting to discredit THE IRRIGATION AGE with the railway companies. In view of the fact that we have told the truth about his association in St. Louis and elsewhere, where his agents are attempting to secure money for which they give nothing in return, they are attempting to secure promises from the railway managers to withdraw support from THE IRRIGATION AGE. It may be interesting to these gentlemen connected with the railways to know

that THE IRRIGATION AGE has never asked anything from the companies that it was not willing to pay for. If the different railway lines choose to advertise in the columns of this paper, our space is for sale at card rates. If we choose to accept transportation in lieu of cash for this space, we are in no wise obligated to the railway companies, and if the management of these railways choose to be guided by the misrepresentation of Mr. Maxwell of the National Irrigation Association, as is evident by the attitude of some of the southern roads, they are, of course, at liberty to do so. We will show them, however, that in playing in with the National Irrigation Association they are making a grave mistake.

The only people we have ever known who have secured anything in the way of returns from the National Irrigation Association or its work are Messrs. Maxwell, Boothe and their employees.

The surprising feature about this whole matter is that men as bright as railway managers are known to be, can be so easily led by men of this class. It is also surprising how loyal this class of men frequently are to a misconception. If they would study the history of the National Irrigation Association and go more carefully into the character of the men who presume to shape the destinies of that organization, it is our firm belief that they would withdraw from any connection with them. To one who is acquainted with inside facts concerning work of this character, it can be readily seen that the only excuse which this organization has for existence is that its active head is a good hand at working the "press bureau racket" and frequently misleads publishers so that they support editorially a movement which on more close scrutiny would be condemned.

From recent information received from St. Louis, at present a center of activity in connection with the National Irrigation Association, we are led to believe that Messrs. Maxwell and Boothe secured endorsements from the head of the Reclamation Bureau in Washington, which is equally as misleading to publishers as are the statements made by these two gentlemen themselves.

The officials of the American Irrigation Federation are at present investigating the connection between the Geological Survey and the National Irrigation Association, and all the facts secured will be furnished and published at an early date. It is expected that very close collusion between the Reclamation Bureau and the Maxwell-Boothe organization will be proved, as well as other interesting conditions concerning this strange and mysterious combination.

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Minidoka Difficulties. The editor of THE IRRIGATION AGE recently made a general trip through the West, taking in the states of North Dakota, Montana, Idaho, western Oregon, Utah, Wyoming and Colorado, where a lot of data concerning irrigation projects, both under private and federal control, was secured, from which articles will be prepared for future issues of this journal.

During this time it transpired that the editor visited the town of Burley, Idaho, on the date set apart for a meeting of settlers on what is known as the south side of the Minidoka irrigation project. This meeting was called so that the settlers of the land could meet and talk with the engineer of that project, Mr. Ross, and learn what provision could be made for securing water for their land. As stated elsewhere in this issue, some six or seven hundred settlers were induced to locate on the south side of the Snake River, where they made proper entry for the land and established homes thereon, with the expectation that the government would establish a pumping plant and supply water for this large area. It was subsequently learned and published by the Reclamation Bureau that this part of the work of the Minidoka project had been abandoned for lack of funds, or some other cause, and this large body of energetic, ambitious farmers were left on an arid sage brush plain with very little hope of securing water, without which the matter of raising crops, whereby they might make a living for themselves and families, is an impossibility.

The writer spent a short time at this meeting and looked over this large body of settlers, all of whom had the appearance of men from whom hope had gone. These men are sturdy and industrious and anxious to build homes for themselves and families.

Mr. Ross, of the Reclamation Service, made a talk to this gathering of settlers, and so far as the writer was able to learn, made no promises of relief; in fact rather placed the blame on the shoulders of the settlers themselves for having gone in and exhausted their homestead rights without positive assurance from the government that water would be furnished them.

It is claimed by those who are in a position to know that the government definitely promised water for this tract, and that these men would not have made entry on the land had they not so understood the situation.

It appears, therefore, to be a great injustice on the part of men connected with the Reclamation Service that these people are today crying for relief with no hope of its attainment.

A sturdier lot of people it would be difficult to find. Men with large families dependent upon them are practically stranded on a sage brush desert, and government officials who are sent to confer with them offer no suggestions of assistance.

The thought which occurs to one who looks over the situation carefully is, why does not the government offer some plan that will relieve the minds of these people of honest intent, who are capable of sturdy endeavor. There is no doubt an inclination on the part of the Reclamation Bureau to do something for these people, but such an impression could certainly not be gained by anything which was said by Mr. Ross, who represented that bureau at the meeting.

It is to be sincerely hoped that the government may take up the case of these people at once and offer them such assistance and advice as will enable them to either re-enter upon the land where water is a certainty, or make provision to supply water for their present needs.

To an onlooker it appears that the head officials of the Reclamation Bureau are not handling this grave question intelligently

EDITORIAL NOTES.

BY G. L. SHUMWAY.

Since the passage of the National Irrigation Act we have urged, as one of the auxiliary duties of the Reclamation Service, establishment of experimental and demonstration farms in each reclaimed community, to instruct new settlers who in the main will be unfamiliar with irrigation, the fundamentals essential to render them more competent to meet requirements.

OUR efforts for a time met with resistance from Engineer Feld, who was in charge of the North Platte Project, for reasons which he has neglected to elucidate. However, we are now glad to note occasional segregations for establishing such farms, and we predict this will prove one very important function of the service, and will materially reduce per centage of failures.

THE President's message indicated clearly that a section homestead is wholly inadequate to support a family in many grazing districts of the West—a fact obvious to anyone familiar with certain areas. Resulting are several proposed measures. The President has alluded to a commendable plan which he will inaugurate in event proposed legislation fails.

WE BEG the privilege of recommending supplemental work for the new department. Experimental farms should be established for introducing new forage plants antecedent to range improvement, and evolving methods of range culture, which, if proven of any considerable benefit to native grasses, with reasonable labor or expense, should be imposed upon lessees as one of the conditions of their leaseholds. By systematic

endeavor the maximum number of homes possible to maintain upon the areas will result. Experimental expense may be paid from the rental funds.

SECURITY of possession of sufficient pasturage for a given number of stock for a period of years will inspire building thousands of substantial homes where now are crude ephemeral structures, and the number will increase whenever improved methods and culture are evolved, or new or more prolific forage plants are substituted for native herbage.

FURTHER consideration for a successful issue of the experiment (which is in line with policies we have advocated for several years) is ample apology for expressing further opinion. The new department could better exercise its prerogatives if independent. Coalition of departments often merits and suffers criticism. Co-ordination rather than beaurocracy is the American ideal.

LAND COMMISSIONER ROSS of Washington, while at Portland last summer, made some interesting statements in relation to federal policies and forest reserves. It appears many townships in the northwest country, which have been included in forest reserves, are unsurveyed. At periods timber from a reserve is sold, which strips the entire area, including (what would be if surveyed) sections 16 and 36 of each township, which are school lands belonging to the state.

BY TAKING advantage of its unsurveyed conditions, the school fund of the state is depleted for the edification of the forestry service, and thereby Mr. Pinchot is able to show increased returns from his division. To extract glory at the expense of school children is about on the level with Mr. Newell's attributes and his abortive attempts to crush the spirit of the occident, and the action of some of the subordinates of Mr. Richards who attempt to build up reputations for vigilance and integrity by misrepresenting the character of the inextinguishable winners of the West.

WE ARE in a position to assert that at least one of Mr. Richard's special agents has fabricated in his reports and imputed fraud to well-intentioned and honorable citizenship, who unfortunately poor, are unable to cope with so formidable and valiant a foe as their beloved government.

THE danger and injustice of bureaucracy is illustrated by the foregoing. It has been stated that information volunteered by a reclamation engineer is taken as sufficient basis for adverse reports. An attache of the Land Department, whose anxiety to make a show-

ing, or whose carelessness is unfortunate, or whose bump of caution is not stirred by such intrusive friendship, may be excused *once* if when apprized of errors he will right the wrongs by modified reports garnered from uncolored evidence. The exalted motive of the original informant in cases under the North Platte project being so evident, ought to be sufficient to prevent a recurrence. The land department can ill afford to be a catspaw of sore-headed sinecures. It ought to protect settlers on public domain from persecutions emanating with reclamation incompetents, who are smarting under criticism.

WE APPRECIATE that some subordinates may not possess equilibrium essential to check their imaginations, but in this instance the persecutions are aggravated by the same person or an associate loaning Mr. Byrd pictures of presumed offenses, who grouped and labeled them "fraudulent" and sent such erroneous conceptions broadcast through "magazine sections" for country papers.

A PERTINENT question at this juncture is: Who pays for these free "magazine sections"? One of two alternatives are obvious and inevitable. The corporate interests, which Mr. Maxwell confessed before a congressional committee he serves, or subterannean avenues of graft.

THE latter apprehension is augmented by bonus guaranteed contractors on the Interstate Canal and by expensive engineering. Why should it cost the government two hundred dollars (\$200.00) a mile for engineering where a similar work by private enterprise costs only one hundred dollars (\$100.00) per mile?

INCAPACITY or lack of rectitude seems destined to make some federal works more burdensome to water users than is necessary. It is asserted that one error (so called from charity) which might have been avoided by a business bureau has cost one project approximately \$75,000, or \$1,500 per mile. It is the referred to bonus to construction contractors to finish work five or six months ahead of contract time. This is found necessary to complete a section of canal to supply water at a date which the United States had previously pledged to deliver it. These overlapping contracts, both supervised by the same lieutenants, managed to pass the usually vigilant eye of the honorable Secretary of the Interior without detection, he evidently reposing confidence in his subordinates' efficiency. Results emphasize our earlier call for a business bureau.

WE ARE inspired to inquire wherein repeal of all land laws, except the homestead act, will aid national irrigation. Lands under any proposed federal canal

are segregated and subject only to the homestead. Lands not under any project contemplated by the United States, if entered by desert or other land laws, contribute to the irrigation fund, therefore rendering support to national irrigation.

HAVE Messrs. Newell and Pinchot yielded the principles of co-ordination and are they seeking to establish the foreign condition of bureaucracy? Affiliated design, or affinity for one another and the coterie of inspirationists, is resulting in departmental decadence, and indications point to an attempt to assimilate the land department. We have noticed that one John E. Field, a reclamation engineer, uses considerable of his time in giving new interpretations of old land laws and advising prospective settlers to contest claims. Whether this advice results from a natural officious intrusiveness or originates in covert policies of Mr. Newell to subordinate and absorb Mr. Richard's legitimate prerogatives, is, of course, more or less conjecture, especially to laymen on the outside. Mr. Pinchot's intrusive interest in proposed lease reserves and extension of forest reserves also indicates ingression on duties of the land department. Shortly, all the land commissioner will need do is sit with folded hands and watch other divisions work out his destinies. He will, of course, get all blame for blunders, otherwise he could be disposed of entirely.

AND now a word relating to the new Federation and how it happened. Had not the National Irrigation Association attempted the crime of breaking the independent mettle of the West, had not its inordinate lust for power inspired imprudent exploitation, had it not attempted to use the reclamation service to intimidate private enterprise into obedience and incident bountiful contributions, had it been loyal to the West and not ignored western cyclopean spirit, had it remembered 'twas this energy which made the National Irrigation Act, had it not by undue influence perverted a noble purpose, there would have been no American Irrigation Federation, for it would have had no reason to exist.

IMMODERATE ambition, and hypnotic control of Mr. Newell impelled conceptions of power which have augmented frenzied policies. Mr. Maxwell forgot the spirit of the West, when he sought its subjugation by directing autocratic federal dominance. It may for a period endure, but a cyclone of energy is accumulating, and demands for a "square deal" vibrates with no uncertain admonition. Mutterings here and there are evidences of an impending calyclism of censure, which even severe critics of mal-administration are endeavoring to temper.

IT SEEMS possible that nothing short of an investigation will make the spoilers pause; they do not conceive the ozone of the West induces the antithesis moribund philosophy. People dwelling in higher altitudes are incapable of subjugation, which bigots of temporary power will awaken to realize.

JUST now the bell wether of the bunch has discovered another mare's nest. To direct attention from his own peculiar attributes, he is crying "thief" at every passer-by. The President is an imputed partner in gigantic swindling legislation. The statehood bill is painted lurid red in crime. Mr. Maxwell's mania for detecting "steals" is best explained by an analysis of his environments, and past associations.

MALODOROUS atmosphere will paint on a canvas of Empyrean blue monstrosities in shapes and colors all its own. The Statehood bill may be unjust to the Southwest territories, it may impose conditions which are undesirable, but inferences of Executive connivance in steals has no justification. Recent administrative endeavor has shown a strong tendency absolutely the reverse to such imputations.

THE American Irrigation Federation and its enunciated principles leads to a hope for better influences, to amalgamation of purposes for greatest possible development of Western Empire. The earlier organization has passed its period of usefulness and its deleterious influences were menacing. If in its expiring throes it drags with it Frederick of the omniscipive, luminous orbs, it were better for the service. David Starr Jordan says: "Paternal governments are always oppressive and blundering." But, if true, many of us must yet be disillusioned. Maladministration in governmental, corporate, or personal affairs alike deserves and brings a day of retribution. Dr. Newall should retire.

NO "STAR CHAMBER" SESSIONS.

The time seems to be ripe for a thorough investigation of the reclamation branch of the Interior Department. The precedent of the postoffice investigation should be followed: no "star chamber" trials. Play out in the open and hear all sides and all comers; then see where the "private" interests were behind the reclamation "knocks" of this Valley of Content.—*Standard, Imperial, Cal.*

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BELLE FOURCHE IRRIGATION PROJECT.

In the allotment of \$34,270,000 which the federal government will spend for irrigation in the western states under the reclamation act, South Dakota will receive \$2,200,000, and a tract of 85,000 acres will be irrigated. This tract is now a gumbo flat north of the Black Hills and near Belle Fourche.

The possibilities appeared obvious, immense and certain to Raymond F. Walter, an engineer of the reclamation service who investigated the field, and is in charge.

The main canal, six miles long, is ready for water to be turned into it. It has a width of seventy-five feet at the top, of sixty feet at the water line, and will carry ten feet of water. At this maximum rate it would fill the reservoir in three months, but as the water supply is from the mountain streams and, therefore, irregular, not all of the freshet supply can be caught and it is estimated that it will require nine months to fill the reservoir to its maximum capacity.

This contract was let too late in October for the main retaining dam which will hold in a natural reservoir an amount of water equaling 40,000 acre feet



Headworks Gate—Belle Fourche Project.

The Pierre clay or "gumbo" now covered with cacti, sage brush and alkali grass is very rich, its great need being moisture at the proper season. This the government engineers propose to furnish in abundance from an immense reservoir, through hundreds of miles of canals and laterals.

Of the total acreage the major part is now in government land, there being practically 50,000 acres of unentered land in the Belle Fourche tract. The portion which is entered is in the Belle Fourche valley and is exceedingly fertile and already has a value of \$30.00 to \$40.00 an acre. This valley is about thirty miles

per year. This contract was awarded to Messrs. Orman & Crook, Pueblo, Colo., whose bid was \$879,164 for the main dam. This firm also bid on the canals and collaterals included in schedules 1, 2 and 3, their total bid being \$1,003,299. This contract was let too late in October for the beginning of the big dam, but operations are under way for the work to be begun in the spring.

The head-works dam for the diversion of the waters of Crow, Red Water and Spearfish Creeks into the main canal, is one and a half miles northeast of Belle Fourche. The main canal, following the lowland, leads in a



View of Main Canal—Belle Fourche Project.

north of the Black Hills; between it and the hills is Bear Butte, a volcanic mountain 750 feet high. Some writers have distorted the facts to say that a volcano would be irrigated.

The headworks dam is practically completed. It is concrete and steel, the seven flood gates being of steel set between concrete pillars of masonry which the government engineers say are practically imperishable. Accompanying illustrations show the form of construction of these head-gates.

northeasterly direction to the reservoir which will include a big basin and the valley of Owl Creek. One big dam crosses Owl Creek seven miles north of the post-office of Snoma and sixteen miles north of the railroad station of St. Onge, and will retain waters in the natural reservoir. There is a difference in level of over one hundred feet from the bottom of Owl Creek to the height of the adjacent hills on either side. The dam will be of concrete with stone riprapping to prevent erosion and will be a mile in length.

From the reservoir, which comprises about 7,200 acres, one main canal will lead to the northwest about nine miles, then, swinging to the southeast twelve miles will continue, with frequent laterals, in a general easterly direction. The main south canal will wind and twist towards the southeast. These canals will outline the regions which will be subject to irrigation. In many places they will cross running streams by means of inverted syphons under the stream beds, these syphons to be built of steel and concrete.

improvements in the town." In the same letter Mr. Walters said: "We expect to be able to furnish water to about 20,000 acres next spring (1906). Most of this will be government land and what is known as Indian Creek Flats * * * there will probably be constructed the large reservoir dam, 100 miles of main canal, 500 miles of laterals and 1,000 miles of sub-laterals with the necessary controlling and measuring devices."



Headquarters of the U. S. Reclamation Service, Belle Fourche, S. D.
(Courtesy of L. H. Storgaard, Staff Artist of Dakota Farmer).

There will be one hundred miles of main canals and five hundred miles of branch canals and about one thousand miles of smaller ditches.

In the construction of the main dam this year, 800 men will be at work with hundreds of teams and several big mechanical dirt moving machines. Engineer Walters has promised that at least 3,000 acres can receive the water this year, 30,000 acres in 1907, and that the project will be completed in 1908. The railroads have encouraged the project, making a half-rate on all materials shipped in for the work, following the general policy of railroads to develop all regions tributary to their lines and make them populous, fertile, and prosperous.

In the Belle Fourche region there is already a private irrigation system installed by English capital, built in a temporary way.

When this Belle Fourche project is completed it will be turned over to the Belle Fourche Valley Water Users' Association, organized among the land owners through the region. On the basis of the original estimate it will cost \$34 per acre for each of the 85,000 acres comprising the Belle Fourche tract, to be paid in ten annual installments. Mr. Walters has predicted that there will be 10,000 settlers on the tract by the time the water is ready to be turned on all of it in 1908.

A town site has been platted on the gumbo seven miles north of Vale postoffice, comprising one section, 640 acres. The proceeds of the sale of the town lots and acreage are to be used for the public improvements of the town—waterworks, sewerage, etc., if the legality of the plat can be established by the Reclamation Service.

Concerning the town site Mr. Walters, engineer in charge, has said in a printed letter of information about the Belle Fourche project:

"One section of land has been reserved for a town site, the lots in which will be disposed of by the Government at auction and the money used for permanent

OUR EXPERIMENTAL FARM.

With this issue THE IRRIGATION AGE presents the first of a series of articles on its supplemental experimental farm near Cadillac, Mich. A tract of sixty-five acres has been secured on a lake one and a half miles south of the city of Cadillac with the intention of making experiments along lines formerly suggested in the "Primer of Irrigation" and in the columns of this journal, whereby water may be advantageously delivered to crops in humid and semi-humid sections of the country. It is our intention during the first year to



View of Virgin Stump Land near Cadillac, Mich., on which the IRRIGATION AGE Supplemental Irrigation and Fruit Farm will be developed. This tract comprises 65 acres, lying around the shore of the lake.

clear off a tract of ten acres, that is to say, remove the stumps from ten acres of the level portion of this land, and plant certain crops such as are usually raised on a small truck farm.

It is hoped that a reasonable degree of success may be attained during the first year, and that we may have a good story to tell of the work as it develops from month to month.

We are showing herewith a half-tone photo of the land as it is today. It will be noted that there are many stumps to be pulled on the level land shown

in the foreground. On the hilly land across the head of the lake, which faces to the south, we have arranged to set out ten acres to hardy winter apple trees, and five acres adjoining will be set out to plum, cherry, pear and peach trees, as well as red and black raspberries, currant bushes, gooseberry bushes, etc.

This fifteen-acre tract will be set out to the above described trees, but it is not our intention to clean the stumps from the land where these young trees will be planted, as we have been informed by the nurserymen (the Hart Pioneer Nurseries, Fort Scott, Kas.), from whom the stock was purchased) that the young trees will do better in land where the stumps are not removed.

We will keep our readers informed as to the success attained from this method of planting.

By examining the photograph it will be seen that these trees being on the south side of the slope near the lake will have an advantageous position for rapid growth.

We have already arranged with the Milne Manufacturing Company, Monmouth, Ill., for one of their best stump pullers, and work will be commenced removing the stumps as soon as weather conditions will permit.

Photographs of the development of this experimental farm will appear regularly hereafter in the columns of THE IRRIGATION AGE. We intend to tell our readers all about the work as it progresses, explain to them fully where and why we are successful, and explain as carefully also, all mistakes made in the development of the tract so that our readers may avoid similar conditions should they follow in our footsteps.

In this connection we would ask our subscribers who have experimented along the line of supplemental irrigation to furnish us a written description of their various experiences for publication.

It is hoped later on that the agricultural press



Engineers and Officials of the Irrigation and Drainage Investigations, O. E. S., in attendance at the Conference held in Washington, D. C., January 16-23, 1906.

R. P. Teele,	F. W. Roeding,	H. G. Raschbacher,	W. W. McLaughlin,
F. C. Herrmann,	C. T. Johnston,	A. E. Wright,	A. P. Stover,
S. Fortier,	C. G. Elliott,	C. J. Zintheo,	A. C. True,
			Elwood Mead,

It is also our intention to set two acres to grape vines on this slope.

A gasoline engine pumping plant will be used on the lake shore which will lift water to a cement lined reservoir located about half way up the hill, at an elevation above the lake level of about forty feet. This reservoir will be kept full and water from it will be turned onto the level ground to supply crops during the dry period, which usually comes in July or August.

It is our further intention to study the matter of supplemental irrigation carefully so as to teach the farmers throughout the United States what may be done with a small supplemental irrigation plant to supply water during the seasons of drouth, to their growing truck gardens, and other small fields containing crops of various character.

of the country may take up this matter and encourage farmers generally throughout the Central States to adopt a method whereby a great saving may be made by the increased volume of crops through the proper application of water during the "dry spells" in the summer months.

Later in the year it is intended to erect a small farm house and barns on the lake shore under the brow of the hill shown in the photograph. A full description of these buildings, and cost of the entire plant will appear in due time in these columns.

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IMPORTANT MEETING OF IRRIGATION AND DRAINAGE OFFICIALS HELD AT WASHINGTON, D. C.

Beginning January 16, a conference of the men in the Washington office of the Irrigation and Drainage Investigations and a number of the field men, was held

but where some crops can be raised without irrigation. The reason for taking up this work is the belief that by the irrigation of small areas—five to twenty acres—in connection with the dry farming of a much larger area, farmers can maintain themselves profitably on the semi-arid plains where existence is now precarious. The plan of the work is to establish experimental farms at some half a dozen points in this region, where small

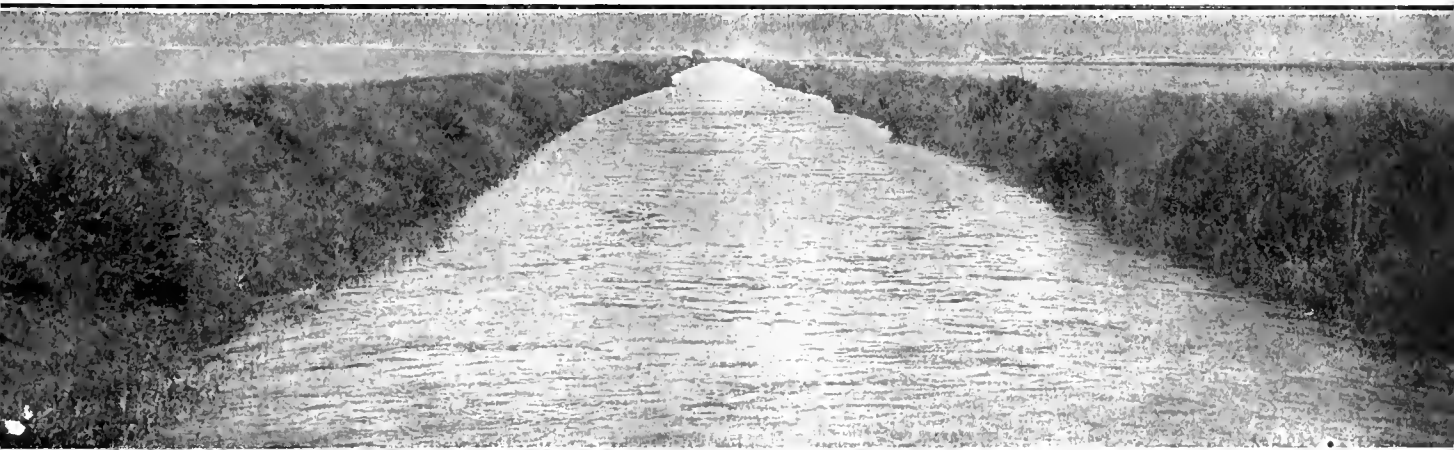


Dam on Tuolumne River above La Grange. 75,000 miner's inches diverted. Dam 327 feet long and 127 feet high.

in Washington. Those present at the conference from outside of Washington were: Mr. Fortier from Berkeley, who is in charge of the Pacific District; Mr. Hermann from Cheyenne, in charge of work in the Central District; Mr. Stover from Oregon; Mr. Culbertson from Texas; Mr. Roeding from Colorado; Mr. McLaughlin from Utah, and Mr. Raschbacher from Idaho. Those in Washington and attending the conference were: Dr. True, Dr. Mead, Mr. Elliott, Mr. Woodward, Mr. Teele, Mr. Zintheo, Mr. Wright and Mr. Singleton.

areas will be irrigated and other small areas farmed without irrigation. This will supply data as to cost of a water supply, and comparative yields. Such a farm is now being operated at Cheyenne, Wyo., under the direction of F. C. Herrmann, and others will be established.

The extension of dry farming into this semi-arid region is based on thorough cultivation as a means of conserving soil moisture, and the study of implements for the seeding and cultivation of grain crops will be



A Stanislaus Irrigating Canal, fed from La Grange Dam.

The conference was chiefly concerned with methods of carrying on work, but much of general interest was discussed.

A line of work which is comparatively new, and one which for that reason received a large amount of attention, was irrigation as related to dry farming, in regions where there is a very limited water supply

carried on at all the stations established.

Careful determinations of soil moisture will be made at all stations, to determine the effect of cultivation in various ways on the conserving of natural precipitation and irrigation water. A committee was appointed to work out a cheap and convenient method of determining soil moisture in the field.

Plans were made for systematizing the work in studying duty of water and means of lessening waste, and methods of preparing land and applying water.

The publication of a series of practical manuals was decided upon, the following subjects being chosen:

1. Manual of Irrigation Practice (revision of O. E. S. Bulletin, 145).



Butte County Irrigation Canal, Sacramento Valley.

2. A Manual of Canal Management.
3. A Manual of Water Measurement and Distribution in Irrigation.
4. Methods and Cost of Pumping Water for Irrigation.
5. The Construction of Farmers' Reservoirs.
6. The Irrigation of Sugar Beets.
7. The Irrigation and Drainage of Rice fields (Texas and Louisiana).
8. Some Special Forms of Organizing Irrigation Enterprises.
9. The Terracing and Drainage of Hillsides.
10. The Drainage of the Atlantic Coast Rice Fields.



Canyon of Pit River, where Storage Reservoir Is Planned, Sacramento Valley.

11. Practical Information for the Settler in Irrigated Districts.

Mr. C. E. Grunsky, consulting engineer of the Reclamation Service, addressed the conference on the importance of duty of water studies; Mr. Haywood and Mr. Skinner, of the Bureau of Chemistry, spoke on water analyses and methods of determining soil moisture, and Mr. Zinthoe discussed the work on farm machinery. Mr. C. T. Johnston, formerly assistant chief of the office of Experiment Stations, now state engineer of Wyoming, was also in attendance, and gave many valuable suggestions as to the work.

IRRIGATION IN CALIFORNIA.

BY A. J. WELLS.

It is old as the Mission gardens of the padres; it is new as the failures of the bonanza ranches of the wheat farmers. Every step of human progress is an evolution, and ideas and convictions had to be borne and make their way in the face of conservatism and deep-rooted prejudices before irrigation in this land of ruinless summers could even be put on trial. The Franciscans who left behind them the remains of irrigating ditches were from Spain and Italy, and were familiar with the process, while their successors as occupants of the land were from humid countries, and had no thought of interfering with or supplanting the agency of the clouds. Besides they found land cheap—to be had by leagues rather than acres, and there grew up two industries, stock raising and wheat farming, neither of which required the irrigating ditch. For years the great wheat farmers plowed and sowed, gathered fortunes at one harvest, lighted the land at dusk by burning straw piles and stubble fields, and only when that kind of farming be-



Butte County Canal near Biggs, Sacramento Valley.

came unprofitable was the way open for other ideas. Happily the failure of the great wheat farm from the methods employed, and from the low price of wheat, and the disuse of large areas for grazing because the land had become too valuable, came at a period when irrigation began to command interested attention, and today great ranches are giving way to the small farmer, and the shining lines of irrigating canals are seen in many directions. It is the instinct of development, which is always wise in the long run; it is the lesson of experience which here has behind it generations of failure. For even in humid countries the bane of the farmer's life is the unequal distribution of the rainfall and the consequent uncertainty of his crops. The farmer is a hardworking agnostic. He does not know what the result of his season's work will be. His planting and sowing is a lottery in which faithful work and practical sagacity are often defeated by the vagaries of the weather. The real difficulty with agriculture is the reliance upon chances. Who would make Bessemer steel if the results were as much a matter of doubt as the farmer's crops? We know the exact per cent of carbon which must be burned out of iron to make perfect steel; we know what amount of moisture is needed to

make a crop in the field, but we do not know what the clouds are going to do. Dependence upon them is guesswork, irrigation is certainty.

In California the pressure of natural conditions steadily impels the farmer towards irrigation, and to-day there is a pretty general conviction that if the State is to make the most of its great agricultural

in which grain will have a part. This will include the application of water to the grain itself, which has not yet been tried.

Water for irrigation in the San Joaquin Valley is chiefly derived from the San Joaquin, Kings and Kern rivers, but a considerable area is watered by artesian wells and by means of pumps. The foothill region east of Fresno for some distance along the edge



Kings River, at head of Reedley Canal, San Joaquin Valley.

advantages that agriculture must be based on irrigation. It is estimated that over 2,000,000 acres are being watered artificially and that 35,000 irrigated farms are raising one-third of the total agricultural produce of the State.

As always in matters of this kind, the evolution of irrigation has followed the lines of least resistance. That is to say it has consulted financial returns and grown up most rapidly in sections where rainfall was most uncertain. Southern California has led the rest of the State, partly for this reason and partly because the chief industry there is the growing of citrus fruits, which require a good deal of moisture. The spread of agriculture into the desert region adjacent to the Colorado River has also enlarged the irrigated area in the south. Next to this stands the San Joaquin Valley, with an average rainfall at Fresno of 10.13 inches, and last of all the Sacramento Valley, where the annual precipitation ranges from 19.41 inches at Sacramento, to 25.40 at Red Bluff.

Bakersfield in the upper or southern end of the San Joaquin shows 4.76 inches of rain, and Redding at the head of the Sacramento Valley, shows 36.11, as an average of a dozen years. Naturally under these conditions the development of irrigation has proceeded more slowly in the north, but in the whole great central valley, which embraces the largest continuous area of high class agricultural land in the world, there is a very general movement toward irrigation, and a conviction that with rainless summers the artificial use of water must be the chief dependence. There will necessarily be diversified farming and rotation of crops,

of the valley successfully produces oranges, the quality being fine and the quantity reaching many hundreds of car loads. Owing to a larger aggregation of heat units during the season, the fruit here ripens two to four weeks earlier than in the South. The orange district



Irrigating Canal near Fresno, San Joaquin Valley.

is steadily enlarging its bounds, and this calls for more extended irrigation. Vast fields of alfalfa throughout the valley call for repeated irrigations and the dairy interests are growing everywhere. The Modesto Dis-

trict, organized under the Wright law, and the Turlock under the same act, provide respectively for 80,500 and 176,210 acres. These districts are provided for by the La Grange dam on the Tuolumne River.

Much land throughout the valley is under the ditch, but not yet actually irrigated. This is only a matter of time and expense for providing laterals and preparing the surface for the distribution of water, though in some cases it is a matter of conservatism, the farmers staying by the old methods and afraid to try what they call "new fangled ways of farming." Intelligence goes with irrigation, and the growth of appreciation of its advantages is characteristically American. The movement is hampered somewhat by the irrigation laws of California, which are a tangle of unwise legislation—the make-shift laws of a new country where mining and mining ditches came first in its romantic history,

cover from one to half a dozen "sections" by their crops, but two new canal systems of large extent have just been completed and a third is nearing completion, while large hopes are entertained that the scheme of reclaiming the waste lands by the control of the flood waters of the Sacramento, can be made to join hands with a plan to cover the whole of the valley by an irrigation system, the point being that the surplus water of the river, which at times can not be confined to any levees, can be diverted into storage reservoirs and held for summer irrigation. Engineers of the Reclamation Service have definitely located six reservoir sites on Coast range streams, five on Pit River and its tributaries, one on the Sacramento itself at Iron Canyon, and surveys are now in progress in the Putah Creek and Feather River basins. These will receive the run-off from nearly 26,000 square miles of drain-



Shoshone Falls, near Twin Falls, Idaho.

and naturally shaped the first legislation governing the appropriation of water. But this, too, will adjust itself in time, the very importance of the question compelling a revision of existing laws.

In the Sacramento Valley alone are perhaps 2,000,000 acres of low lands, that is of flat or valley lands proper, besides a great area of foothill lands capable of sustaining a large population once it is made productive by irrigation.

It is but a little while since the phrase "No irrigation needed," was heard throughout the valley, but today the people talk, instead, of the abundance of water for their broad acres. It is thought that not more than 40,000 acres are actually under irrigation in the Sacramento Valley, but there are movements in this direction and a growing conviction that irrigation is essential to the most profitable use of the soil. There are still some large wheat farmers here, able to live easily on the profits of wheat raising where they can

age area, the estimated annual run-off being enough to cover the entire valley more than nine feet deep. These reservoirs, the engineers point out, will serve two ends, they will relieve the river levees of much pressure from flood waves, and lessen the difficulties of flood control, and they will serve to increase the summer flow of the river by about one and one-half million feet. Prof. J. B. Lippincott, supervising engineer, says: "The irrigation and drainage of the Sacramento Valley is a co-ordinate work and must be so considered," and while the attitude of California generally is in favor of self-help wherever possible, the greatness of the problem in the Sacramento Valley makes national help indispensable to its solution. Even then as Mr. Lippincott says, "the magnitude of the work and its cost is such that a comprehensive plan * * * can not be executed at once even by the Federal Government. Fortunately the work can be constructed in units."

Private interests, counties, boards of trade, and chambers of commerce throughout the Sacramento Valley are of one voice concerning this great project. It provides at once for an irrigation system to cover the entire valley, while it is the only plan thus far devised to relieve the lower and central part of the valley from the menace of annual overflow. The general and permanent prosperity of this great valley is dependent very largely upon its irrigation and drainage under a scheme so extensive that the co-operation of the Federal Government is regarded as imperative. The officials of the

The situation in the great central valley of California is unique. It is practically one valley, though drained from opposite ends, and the slope is so gradual for 200 miles each way, and from the foothills to the axis of the valley, that the irrigation expert could not wish a fairer field. It is every way desirable that there should be for this magnificent region, one, or at most two comprehensive systems providing at once for irrigation and drainage, but the outlook today is promising, and there will be here in a few years great wealth and great beauty as there is now great opportunity. A



Perrine's Coulee, near Twin Falls, Idaho.

Reclamation Service have commanded the entire confidence of representative men in California for their expert knowledge and their thorough comprehension of the practical bearings of the plans they have devised for this great valley, and it is something for general felicitation that so great an undertaking should have been entrusted not only to very able men, but to men under the civil service, and unhampered by any partisan interests or political pressure. When these men say that "the Sacramento Valley presents one of the greatest, if not the greatest, opportunities for irrigation development to be found in the West," it must be regarded as testimony of the very highest character.

fertile soil and much of it, abundance of water easily applied, and a climate which never interferes with the irrigator, but allows him a free hand, and carries the growing season through the whole year—this puts the great factors of production in the farmer's control, and if he does not succeed he himself is at fault and not the conditions.

Railways have contributed vastly to the growth of the West, but a phenomenal development in the next twenty-five years may be looked for as the result of irrigation, and perhaps of all the irrigable lands, California promises most of beauty and bounty.

THE TWIN FALLS PROJECT.

Every Condition Seems to Favor This Remarkable Section of the Gem State.

Irrigation is King.

This great irrigation enterprise under close and careful business management is demonstrating to the satisfaction of the most skeptical that irrigation is the true science of farming. The company has also had the foresight to engage one of the ablest and most practical farmers in the Northwest, Hon. Alec McPherson, who is busy with the farmers all the time, giving them practical instruction and the benefit of a long and successful career as an agriculturist.

IRRIGATION INSTITUTIONS AS A FACTOR IN ECONOMICS.

BY WILLIAM W. GAMBLE.

Secretary of the Eldorado Co-operative Canal Company (Montana).

There is an awakening of the American people that may be compared to a breeze that stirs dead leaves in Valombrosa and we recognize that the atmosphere has changed. It is the process of evolution and we understand that the conditions of society are not permanent conditions, but are those of change. Yesterday, and the extreme conception of an uncontrolled and unbridled individual enterprise was the accepted condition. Today the result of this unregu-



Hotel Perrine, Twin Falls, Idaho.

Mr. McPherson is also authority on horticulture. Over 50,000 acres of this great area of 240,000 acres has already been cleared of sage brush and placed under cultivation.

The Twin Falls project is one of the most attractive irrigation enterprises in the arid zone and deservedly so. During the last twelve months over five thousand people have located on the Twin Falls tract, most are there to stay. The Minidoka & Southwestern Railroad, a branch of the Oregon Short Line Railroad, has just been completed as far as the "Power City," Twin Falls. This road practically runs through the center of the tract, giving the farmers the benefit of up-to-date transportation; climate, location, fertility of the soil, markets, coupled with the broad, humane, sensible policy of the Twin Falls Land & Water Company, makes this enterprise especially attractive to the man or woman who is looking for a home in the new west, where if they are willing to labor their reward is a certainty.

lated enterprise, the exploitation of the many for the benefit of the few is questioned and a vision of public control fills the imagination. Tomorrow and the remedy of public ownership will be suggested to the minds of many. The magazines of the country have for the past eighteen months been publishing a series of destructive articles; destructive because they have awakened in the minds of many a realization of the dangers and injustice of present conditions. They have also begun a series of constructive articles; constructive because they invoke the experience of other lands to afford in so far as that experience can afford, help for us in determining our own course through the eddying currents of democratic, industrial, economic and social theories that throng the way.

The American people, long fed upon sensational reports of great investigations, are intently studying the

vital problems of graft, monopoly, boss rule and frenzied finance, which have come with us to stay, for such study, and for a solution in the light of new ideals of politics and legislation. But it is not alone in a study of the achievements of graft at home and co-operation and government ownership abroad, to which we may look for an influence that is to weld the mass of conflicting ideals into working order. The experience of democracy in America and the efforts of American legislators to adapt the principles of the common law, which

conceptions. Just now, the subject of irrigation is uppermost in the mind of the American "West." This subject is in its infancy and few understand much about it. We may guess at its importance as a social factor, but as yet have no clear understanding of the economic conditions to grow out of it, for, *irrigation farming and the establishment of irrigation institutions consequent upon it will alter the economic and social conditions of our country, not only in states under irrigation, but also in states where irrigation is not*



An Irrigation Ditch in the Lower Rio Grande Valley.

makes the rights of private property subservient to the public good, will also assist and the captain of industry, conceived in socialism and nurtured into full fruition under the latitude permitted by American institutions, must look well to his hard-earned laurels and show his right to live.

practiced. The reconstruction of the State made possible by the approach of new economic conditions must have a practical direction and come as a result of institutions upon the statute books registering the results of experience and careful experiment. The principles established by irrigation institutions are to the point



Harvesting Onions along the line of the St. Louis, Brownsville & Mexico Railway.

From the West come new ideals of politics and legislation, and the more so now that the West and the East are brought closer together. Emigration has since the dawn of history moved westward and ever upon its course it has given back to the East new

and may be summed up in the following order:

1. The assertion of ownership of water by the State.
2. The necessary connection of water with land (for the purposes of use and of transfer.)

3. The doctrine that beneficial use is the basis of right.

These three propositions constitute a very important whole. They are inseparable from and their acceptance will necessarily follow the establishment of irrigation institutions by the general government

these facts. The theory of economics is that all natural monopolies should be managed for the public good and not for the benefit of special interests, and the conclusion reached is that while private monopoly applied to this class of subjects is a curse, public monopoly is also a blessing. Under the old law of England, which



Irrigated Truck Farm along the line of the St. Louis, Brownsville & Mexico Railway. Irrigation Scenes Southwest Texas. and the several States. The fact that such institutions are established establishes at the same time in the statutory law of the land correct principles of public ownership and of co-operation. The establishment of principles applied at first only to the subject of irri-

has never been changed, the principle is laid down that "land is public property vested in the Crown" (the government as trustee for the public benefit). In America "the monarch's supreme ownership of the land is replaced by the people's supreme ownership of



Sugar Cane Field in the Lower Rio Grande Valley.

gation will eventually have an influence upon all statutory law to which the theory of public control, of co-operation, or of public ownership can be applied, but to no other subject will it have a clearer relation than to that greatest of all economic questions, *land*.

Water for irrigation purposes is of the same economic nature as land. This is a very important

the land." This is fully recognized in irrigation institutions. If we connect water with land for the purposes of use and transfer, apply to it the theory of public ownership with co-operative control, and then lay down the rule of law that only beneficial use is the basis of right, and we have not only the main underlying principles of irrigation institutions, but we also



Irrigation Scenes in Southwest Texas.

fact. It is a *natural monopoly*. Water used for domestic purposes in a city or for irrigation purposes in the country is of the same nature. The great economic value of irrigation institutions is that they recognize

have a recognition of the essential principles that should govern most of the economic discussion of our time. These measures and principles established in statutory law become an object lesson of correct political, social

and moral ideals, and so established will eventually be applied to all monopolies, both natural and artificial, wherever found.

Section 8 of the National Irrigation Act reads as follows: "Nothing in this Act shall be construed as affecting or intended to affect or to in any way interfere with the laws of any State or Territory, relating to the control, appropriation, use or distribution of water used in irrigation, or any vested right acquired thereunder, and the Secretary of the Interior, in carrying out the provisions of this Act, shall proceed in conformity with such laws and nothing herein shall in any way affect any right of any State or of the Federal Government, or of any land owner, appropriator or user of water in, to or from any interstate stream or the waters thereof: Provided, that the right to the use of water acquired under the provisions of this Act shall be appurtenant to the land irrigated, and beneficial use shall be the basis, the measure and the limit of right."

It will be observed that the National Irrigation Act, now a part of the law of the land, recognizes three

THE WONDERFUL TRANSFORMATION OF SOUTHWEST TEXAS.

BY WM. DOHERTY,

General Passenger Agent St Louis, Brownsville & Mexico Railway,
Corpus Christi, Tex.

Former conditions in Southwest Texas disputed and contradicted themselves. Adequate and apparent resources, which were synonymous with opportunity, and which argued for progress, were opposed by a deficit in certain essentials which made advancement and development impossible. Despite the favorableness and even attractiveness of conditions in many respects, deficiencies in others opposed every effort in the direction of development. In other words, conditions were disjointed and deformed and the remedies for correcting the ailments were wholly inaccessible.

When the first settlers took up their residence in Southwest Texas it did not take them long to discover that they had not associated themselves with a



An Epitome of the Past in Southwest Texas.

things: State ownership of water; the natural relations of land and water, and the theory of law that beneficial use is the basis of all right. The provisions of this Act must control a uniform system of irrigation law that the States under irrigation institutions must necessarily enact, and, in fact, such enactment is well under way. While the establishment of irrigation institutions may not have an immediate effect upon the general institutions of the States, the mere fact that they recognize principles long recognized as correct by the common law will speedily leaven, once the movement is started, the whole of the statutory law of the land.

country of great agricultural possibilities under the then existing conditions. It was plainly apparent to them that while the land of their choice possessed fertile soil and magnificent climate in uncurtailed abundance, an almost complete absence of any considerable amount of moisture would compel them to direct their energies to other channels if they expected to remain and live.

It is not strange, therefore, that Southwest Texas has always been known as a land of cattle, bronchos and ranchmen, and that every effort to induce a development of any other description was met with summary defeat.

In the vicinity of Brownsville, things were different. The city had to live and, living as it did unto itself, it was compelled to find in itself the solution of all problems that might affect its existence. Experience soon taught the inhabitants that all effort to produce crops under existing conditions was useless. The

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soil was fertile and eminently conducive to plant growth, but the lack of sufficient water by natural means made production vaguely uncertain. But necessity demanded the prompt solution of the problem, and it was found in irrigation from the river. The result was phenomenal, and it was not long until the river valley in the vicinity of Brownsville was transformed into a garden of richness, blooming as a rose—a veritable oasis in the midst of a desert of almost limitless dimensions.

As far as Brownsville and the river valley were concerned the vexatious problem was solved, and only established and permanent means of transportation and communication into the outside world were needed to insure a rapid agricultural development, but that vast

premiest tests and upon which the thousands of cattle had waxed fat, in summer and winter, began to wither. Cattle grew poorer and poorer physically, and the ranchmen grew poorer and poorer financially. The situation seemed to admit of no alternative and large holders, who owned hundreds of thousands of acres, sought refuge from the impending crisis by offering their lands for sale at a mere pittance. By way of parenthesis, it might be said that some of the very land that five or six years ago could be bought for less than a dollar an acre, is now being eagerly solicited at twenty and twenty-five times that price.

But a marvelous occurrence, an apparent decree of Divine Providence for the redemption of His own,



The Secret of Success in Southwest Texas—Over three hundred wells are bringing certain wealth to farmers along the line of the St. Louis, Brownsville & Mexico Railway.

stretch of "dead land" to the northward presented an unanswerable argument against the provision of transportation facilities, and only made the valley's isolation more complete.

But the great land owners, the ranchmen, the rulers of the great cattle empires, were not oblivious to their own welfare. The infrequency and uncertainty of rainfall made the problem of providing water for their great herds one demanding immediate and serious consideration. The prolonged drouths to which the section was subject frequently called this necessity to their attention with particular emphasis. Things went from bad to worse. Drouths became more and more frequent and more and more tenacious. The indigenous grasses, which had always withstood the su-

in the twinkling of an eye, almost, brought about a complete transformation of conditions and reconstructed the destiny of the entire section upon the broad scale of unlimited possibilities.

Artesian water, as pure as ever flowed from a mountain top, and in quantities apparently unlimited, was discovered. The initial discovery was followed by experiments by the score, and every attempt was rewarded, as was the first, by magnificent flows, varying from one hundred to nine hundred gallons per minute.

Needless to say the phenomena was such in its indications of possibilities as to attract the notice and investigation of capital, and it was not long before the St. Louis, Brownsville & Mexico Railway was in process of construction.

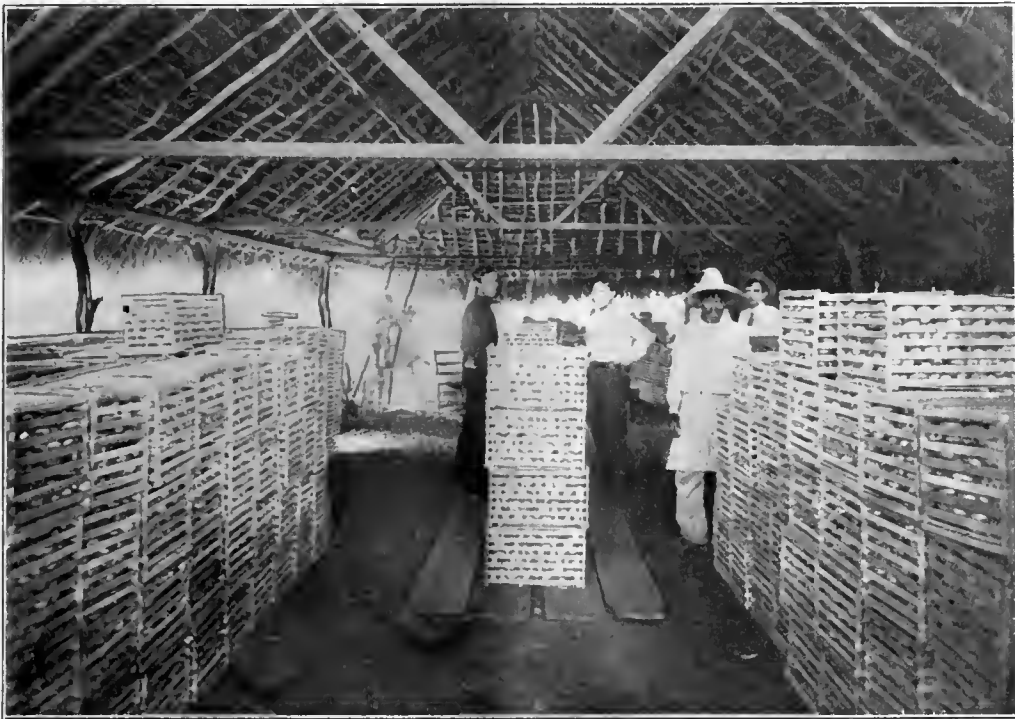
The provision of the two essentials, water and transportation, the lack of which had stifled the future of the section within the narrowest possible limitations, was all that was needed to make the future of southwest Texas as attractive and roseate as it had been unattractive and tenebrious in the past.

The foregoing has been presented with a view of emphasizing the reason why the territory adjacent to the St. Louis, Brownsville & Mexico Railway offers such advantages and inducements today as contrasted with its former uninviting status.

The discovery of artesian water, augmented by the unexcelled opportunities for river irrigation, which made it possible to utilize the fertile soil and equable climate for crop production, metamorphosed southwest Texas from a cattle country into an agricultural and horticultural section of indescribable merit.

way in the Rio Grande Valley seventy-five miles above Brownsville and one hundred miles from the coast. No other locality abutting the Gulf of Mexico possesses the same unusual recommendation of uncommon or rather extraordinary elevation as southwest Texas.

Bluffs of considerable altitude rise abruptly at the water's edge, and form the abutment of a vast table land, which extends inland with a gradual and imperceptible increasing elevation of approximately one foot to the mile for more than one hundred miles. The point of highest elevation is at Fordyce, the terminus of the Hidalgo Branch of the Rio Grande Valley, where the foothills that follow down the course of the river from the west, lose themselves in the table land. From this point the elevation falls in two directions—toward the southwest, following the river, and toward the gulf in an easterly and northeasterly direc-



Onion Packing House in the Lower Valley of the Rio Grande, tributary to the St. Louis, Brownsville & Mexico Railway.

The provision of railroad facilities has left no problem unsolved.

In no other section of the United States today is there to be found a soil of such marvelous richness and fertility, and a climate of such equable and evenly balanced characteristics as exist in the gulf coast country of southwest Texas. Add to this combination a system of controlled moisture which the irrigation possibilities of the section guarantee, and you have the most self-sufficient, certain and enduring agricultural proposition conceivable.

Topographically speaking, southwest Texas, traversed by the St. Louis, Brownsville & Mexico Railway, is for the most part level, with occasional breaks, which give ample assurance of good drainage. The elevation varies from about thirty feet at the coast to over one hundred at the most inland point reached by the Hidalgo branch of the St. Louis, Brownsville & Mexico Rail-

tion toward the Nueces River. In substantiation of this fact it is both peculiar and noteworthy that for over one hundred miles northward from its mouth, the Rio Grande can not boast the possession of a single tributary on the Texas side.

The lay of the land is such that the entire drainage of the section is east and northeast toward the gulf. A number of "arroyos," "hollows," more commonly known as ravines, jut back from the coast and constitute a magnificent natural drainage system, which entirely relieves the section from swamps and marshes, which are frequently detrimental to health and industrial conditions in coastal countries.

It is extremely doubtful if any other locality of similar dimensions can boast of the variety of soils of southwest Texas. Almost any character of soil recognized as conducive to the production of particular crops can be found somewhere in the section. The ter-

ritory traversed by the main line from north of the Nueces River to the Rio Grande, varies in character from a heavy black sandy loam to a sandy soil of lighter substance and different capabilities. Beginning north of the Nueces River the soil is black and very heavy. Proceeding southward in the direction of the Rio Grande, a gradually increasing sandy element is added to the soil, the proportion increasing by degrees until it reaches a character of distinct sandiness about midway between the two rivers. Then the percentage of sand slowly decreases as the distance toward the Rio Grande lessens, until the magnificent alluvial soil of the valley—made under circumstances similar to the formation of the far famed valley of the Nile, by overflows of the Rio Grande in countless ages past, is encountered about fifty miles north of that river. The rich alluvial soil continues southward to the river and up the valley paralleling the Hidalgo Branch of the

It has been common habit for one section to claim emphatic precedence over all other localities in the equableness of its climate as affecting health conditions, and its conduciveness in effecting plant growth. In the process of reasoning leading up to this conclusion it is, of course, necessary to distort facts in many cases.

(To be continued.)

FAVORABLE INDUSTRIAL LOCATIONS.

The North-Western Line traverses a territory famous for its great agricultural productiveness. Its splendid development in this respect has founded and sustains many prosperous towns and cities equipped with all the conveniences of modern times. With the growth of this fertile district there arises a demand for the utilization of the high class of help that can give attention to manufacturing industries. Beside this desir-



Artesian Well and Reservoir—Ranch Home of the La Para in the Background.

St. Louis, Brownsville & Mexico Railway on both sides for a number of miles. The depth of the soil varies as generally as does its character, from a few inches over a foot to a score or more of feet. In the Rio Grande Valley, where the soil has been made by alluvial deposits, it is frequently asserted that the soil has no depth, by which is, of course, meant that the soil is so deep that a subsoil is of no consideration. The subsoil, however, where it is encountered, is substantial clay of retentive characteristics.

In this connection it might be said in passing that no other locality in the entire South possesses such a diversity and variation of rich and fertile soils, each claiming superiority in the production of the particular crops to which it is adapted, as exist in the territory contiguous to our line.

Equally important as the question of soils in the production of crops, and more important because of its never-ending influence upon the trend of population and development, is the consideration of climatic conditions.

able advantage to manufacturers there are many natural resources of much value. The most favorable home environment is found in this rich and growing Northwest, an element that contributes considerably to a satisfactory and permanent business location.

The transportation facilities afforded by the North-Western Line are unsurpassed, giving prompt communication with the sources of supply and the markets of the world. To provide information to parties seeking new locations for industrial enterprises the North-Western Line is giving special attention to the advantages and needs of points along its line, working in co-operation with the local Business Men's or Commercial organizations where such exist and giving direct attention to other points. The information thus obtained is given free to all who desire it, the whole purpose being to develop the industrial welfare of the territory served by this great system of railway.

Prompt attention will be given to communications addressed to George Bonnell, Industrial Agent, C. & N. W. R'y, Chicago.

A SERMON ON HAY MAKING.

BY AN EXPERT.

If, immediately following the mower, you should take a fork full of the freshly mown hay, carry it under the shade of a big tree and gently toss it in the warm summer air, you would make perfect hay. The hay would not be bleached, sun burned or discolored; it would retain its nutritious juices and its green color; it would be uniformly cured; it would not be broken or tangled.

Our aim is to approximate such treatment as nearly as we can in the field. To prepare shade we must use the hay itself; by raking it into large windrows quickly, a very inconsiderable fraction of the hay is left exposed to the sun; thus it shelters or shades itself. The rays of the sun are, in their direct effect upon the grass, absolutely and unqualifiedly a detriment to good hay making. They sun burn and bleach the hay, robbing it of its nutriment, destroying the tender and finer parts of the plants and minimizing its feeding value, and as a natural result its sale value. It also lightens the weight of the hay; thus further reducing its commercial worth.

Grass left in the swath for curing makes golden hay, and very undesirable hay for feeder or buyer. The greener you can get your cured hay the better your grade, and the only way to get green hay is to stir cure it, and get it out of the direct sunshine as quickly as possible. The sun is constantly drawing moisture from the atmosphere; it is of indirect service in raising the temperature so as to set in operation the natural process of evaporation.

The atmosphere in turn searches for moisture wherever it can be found. Now, it is evident that if the warm and dry summer breezes can be passed through the hay that the curing will be accelerated. The grass, as it falls from the mower, is laid in tiers by each stroke of the knife; each tier or layer overlapping the other and thus forming a thatch. This thatch prevents the atmosphere from coming in contact with the under hay, that which lies in the stubble. Bear in mind that it is the under hay that needs your attention in the thatched form.

The grass shades the ground far more densely than when standing unmoved, and wherever the ground surface is shaded there evaporation is minimized and the moisture constantly rising out of the cooler ground and remaining unvaporized, cools and dampens the under side, if not the entire under half of the swaths.

Now the purpose is to save the top from bleaching and discolorizing and to cure the bottom, and thus to cure the hay uniformly it becomes necessary to stir that hay, at the same time converting the swaths into windrows or hay cocks. In the older countries, such as Germany, France, Sweden, etc., it is common custom for the women and children to go into the field with the mowers and just as soon as the grass is cut they begin working it, tossing it in the air and piling it into hay cocks or raking it into windrows. These people know the value of hay properly made and they take pains with it to get the best possible grade. Our American farmers will some day open their eyes and see what they are now annually wasting by improper and careless hay making methods.

What the foreigner does by hand we propose to do by machinery, thereby effecting an economy in the work, and at the same time gaining as high, if not higher, grade of hay. But we have been digressing. We are now ready for our windrow. We want a place for it. We do not believe in the throwing of some swaths into undisturbed ones, for that would be only aggravating what we are trying to avoid, viz., a damp stubble. We want a raked stubble and a dry stubble. We want this because a raked stubble on the average summer day quickly becomes warm and we want that warmth in our hay making; furthermore, from a raked dry stubble, we get the reflected rays of heat to help force rapid curing.

Summarizing, we would say, that good hay making consists of procuring a speedy handling of the hay immediately after cutting, exposing as little of the hay as is possible to the direct sunshine; also in exposing that little as short a time as is possible, and that by stir curing the hay, moving it away from its original stubble and throwing it on a dry warm stubble, by soft handling, will produce the best possible results, giving the farmer a higher grade of hay than is possible with any other method of handling.

Now, we ask you to please follow our process step by step. We build the only two-way or reversing side delivery hay rake, or what we now term our Tedding Windrower. We advocate following the mower with this machine about an hour after cutting. The rake is designed to take two 5-foot swaths. With the cross carrier set so as to discharge the hay to the right, drive the rake with the mower, throwing the first and second swaths onto the third; drive completely around the field. In starting the second round, reverse the cross carrier, and still following the mower, drive to straddle the third and fourth swaths. By doing this you then collect all of the hay from the first and second swaths as well as the third and fourth swaths, throwing them back onto the dry raked stubble prepared by the rake on its first round. That this stubble dries so quickly you can attest by placing your hand down in the stubble soon after raking. In a remarkably few minutes on a warm summer day, you will find it quite hot, your hand being considerably warmer in the stubble than in the direct sunshine.

In handling hay in this manner it is lifted entirely free from the stubble and carried through the air about forty feet; the hay from two swaths is handled thus twice and the hay from the last swath, having only one stir curing, is left loose on top of the windrow, so that the air can circulate easily through it.

Following this method the farmer can now and cure his hay in the forenoon and in the afternoon of the same day he can pull his New Deere loader into the field and can have all of his cut hay in the barn before nightfall, all out of harm from the dew, possible rain or the morrow's sun.

The floated gathering drum with its flexible fingers, not only handles the hay positively and absolutely clean, but treats it kindly and softly, without damage or roping of any nature. The hay is handled as a sheet between two rollers. Notice that our raking is done about six inches above the stubble, the hay being thatched as before described. If the rake is driven with the mower it helps lift itself, and thus our cylinder

fingers take it about six inches above the ground and hand it to the elevating carrier. This allows the machine to rake only the hay and leaves all trash in the stubble undisturbed.

All other gathering or raking devices, must reach down into the stubble in order to rake clean and, consequently, they are not free from trash gathering. With this floated cylinder, studded as it is with flexible fingers, new meadows can be raked clean without the least trash from the stubble.

We employ a spread hitch, the intention being for one horse to walk on the raked ground, the other in the path of the grassboard of the mower. This construction is employed to avoid the horses tramping the hay, breaking and thrashing it. This has been constantly kept in view—soft handling.

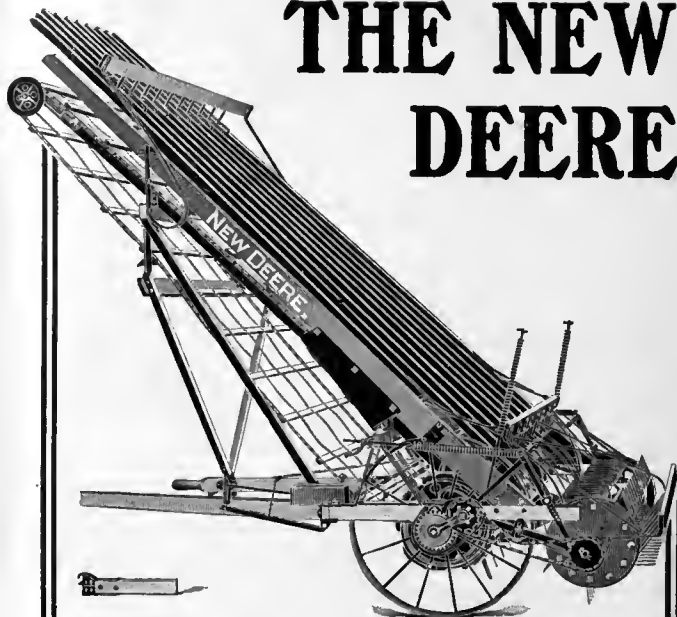
All of our rake mechanisms are yielding and self-adjusting. Alfalfa, clover and all delicate grasses can be thoroughly and quickly cured with this machine without damaging the small stems and leaves, which are the valuable parts of the plant.

This machine is more than a reversing side rake. It is also a tedder. The ordinary common tedder has been used, because the farmer has not known of anything better. It has served the purpose, even with its limitations and faults. Its severe action, however, breaks and damages the hay badly. If the forks are set so as to ted the bottom hay, then trash is gathered and cocked up also. If it was set so as to avoid trash gathering, the very hay that needs disturbing and tedding the most, is left undisturbed and untouched. Then, too, why does a farmer want to ted his hay and leave it in the swath? He either has to do a lot of unnecessary driving with his loader or Buck rake, or else he must windrow later with another operation. Why is it not a sensible thing to ted and windrow at one time, and in so doing do a better job of both with one-half of the expense?

It must be borne in mind also that the tedder gives the swath no opportunity to dry and the hay falling back on the undisturbed ground absorbs moisture from the damp stubble, instead of getting the benefit from a raked and dry stubble. And swath loading, how foolish it is. Think of the long drives with the loader, the extra work for the horses, the waste time of the farmer and his help, the poor sun bleached, half worthless and light weight hay after you do get it. It costs you more to harvest it and then brings you less in the market. It is rather parallel to burning a candle at both ends. Then in addition there is danger from rain and from dew. In consequence where the dew fall is heavy great damage is annually done to the hay. Every dew drop leaves a black spot and the hay is badly discolored. One day hay making by our stir curing process is the farmer's only safeguard against damaged hay.

City buyers grade hay. Jobbers are often times disappointed in price returns. It is because good hay sells for a good price and poor hay for a poor price, and the poor predominates. The average American farmer has made no study of hay making and is making his hay as his father before him. He is often times disappointed and dissatisfied with the returns from his shipping hay and he blames the commission man or the jobber or the market, failing to conceive that possibly the grade of his hay was responsible

THE NEW DEERE



A New Type of Hay Loader

THE ONLY LOADER WITH FLOATED
GATHERING CYLINDER HAVING
FLEXIBLE FINGERS

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That will load **anything** from lightest swath to the heaviest windrow—

That will pick up large **separate bunches** of hay, or **separate sheaves** of any crop, whether bound or unbound—

That works just as well on **rough** as on **level ground**, and that handles hay in a **soft persuasive** way under all conditions—

That is at home in any field and can follow the mowing machine in every kind of crop which can reasonably be called **hay**—

If there is any comparison between the "rake bar" type of hay loader, and the New Deere Loader, it is **all in favor of the new Deere**.

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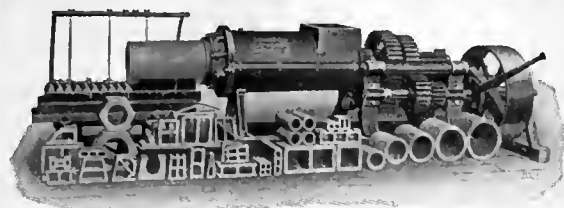
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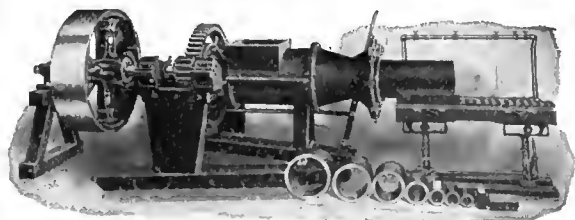
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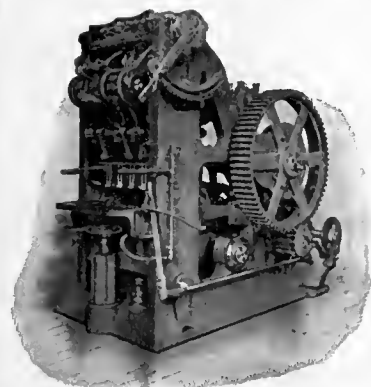
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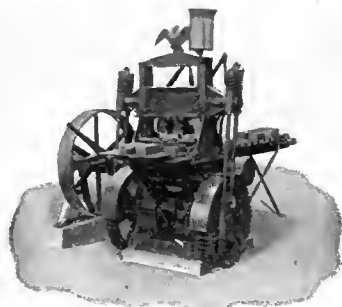
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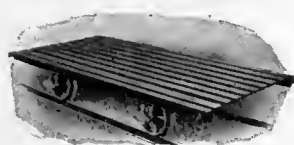
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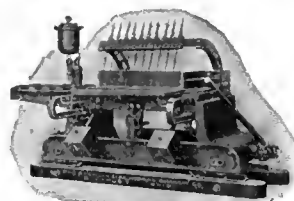
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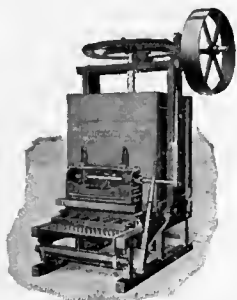
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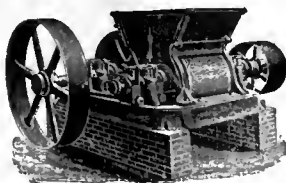
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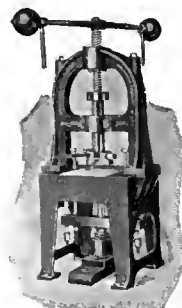
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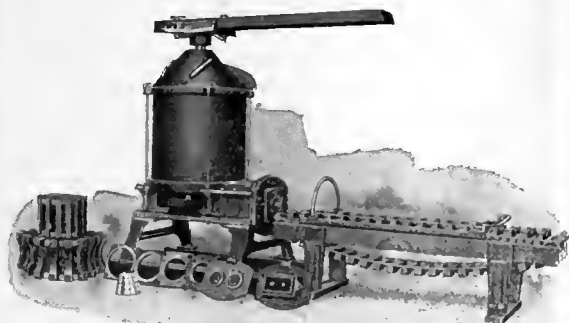
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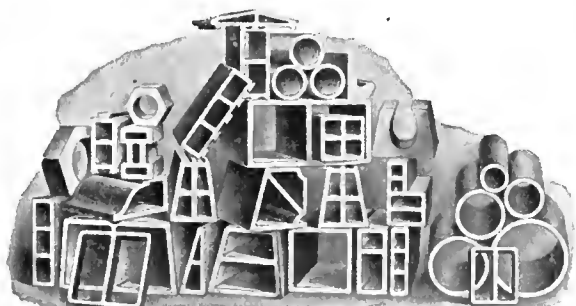
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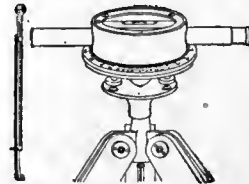
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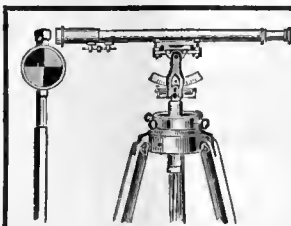
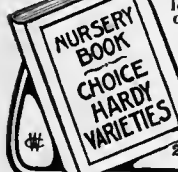
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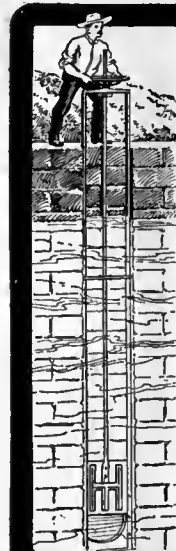
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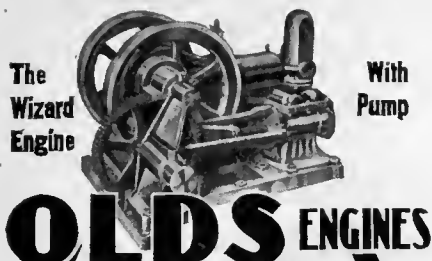
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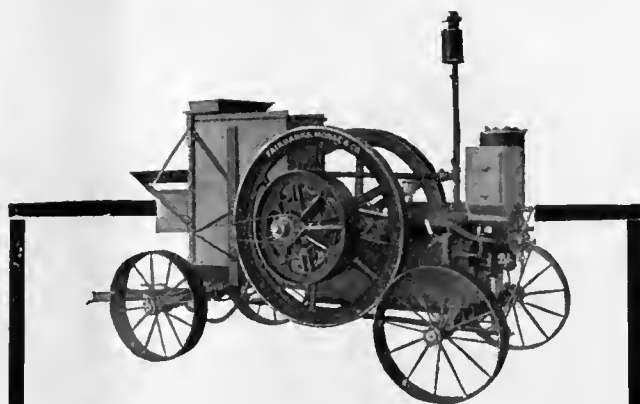
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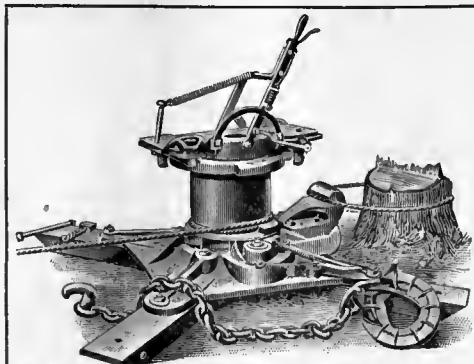
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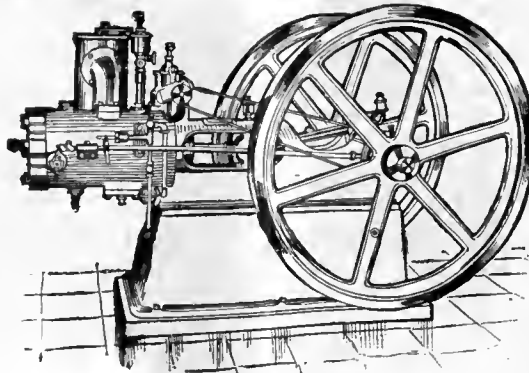
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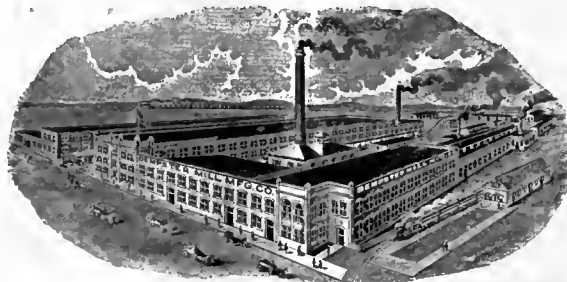
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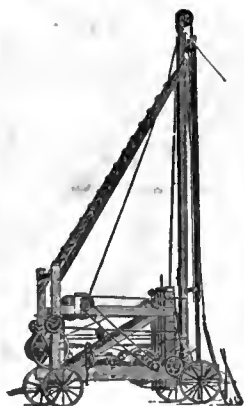
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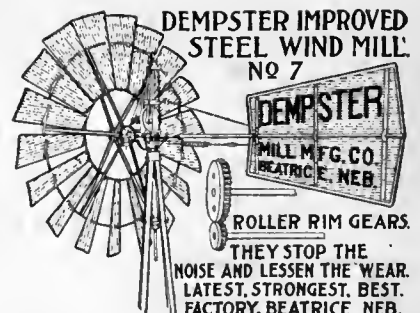
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1906

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OVER 100,000 ACRES

of the best irrigated land in the world, lying immediately north of the MAIN LINE OF THE CANADIAN PACIFIC RAILWAY at Gleichen and extending back ten miles in a solid block.

THE CANADIAN PACIFIC RAILWAY
will forever maintain the canals and laterals at a nominal cost of 50 cents per acre per annum.

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PER ACRE

IRRIGATION IS PRACTICAL CROP INSURANCE

No Floods No Droughts

J. J. HILL, IN A RECENT NEW YORK INTERVIEW, SPEAKING OF IRRIGATION, SAID: "IRRIGATION, Colonization and Co-operation. I put IRRIGATION first, because if it is properly and correctly done you can add to the population of a section and provide each new settler with a farm of 200 acres. With RAINFALL under his control the farmer can easily produce as much from 200 acres as he can from 500 acres. One of the greatest FERTILIZERS known to the world is WATER."

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WE HAVE SOME ATTACHED AREAS OF NON-IRRIGABLE LANDS WHICH ARE COVERED WITH A SPLENDID GROWTH OF GRASS AND PERFECT FOR GRAZING LANDS. WHICH WE WILL SELL IN CONJUNCTION WITH THE IRRIGATED LAND. THIS WILL MAKE AN IDEAL COMBINATION OF IRRIGATED AND NON-IRRIGATED LAND FOR FARMING AND STOCK RAISING. AS THERE ARE COMPARATIVELY FEW OF THESE COMBINATION FARMS, IT WILL BE WELL FOR YOU TO MAKE A SELECTION AT ONCE.

Ample hotel accommodations at Gleichen will provide you comfort, and we will furnish teams and drivers to show you over the tract, free of expense. Upon application to undersigned, stating that you want to inspect this land, we will furnish you with a certificate enabling you to buy a ticket over the Canadian Pacific Railway lines from any point at which you wish to start to Gleichen and return, at a rate of one cent a mile from the Eastern and Southern points reached by the Canadian Pacific Railway, and a rate of one fare for the round trip from points on the main line West of Calgary to the coast.

These lands will be placed on sale at merely nominal prices, our object being to establish a great agricultural community rather than to sell these lands at their real value, either as judged by their crop production or the prices of irrigated lands elsewhere. The terms of sale will be one-quarter cash and the balance in five equal annual installments at 6 per cent interest. This land will be sold in tracts of 80 acres and as much more as you desire. Remember, first come, first choice.

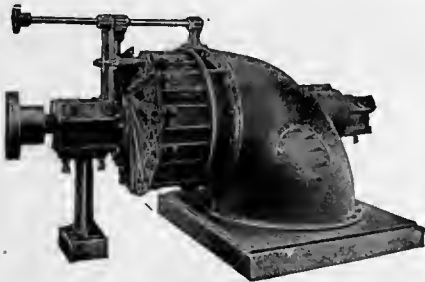
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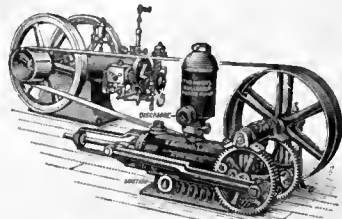
just as good as we know how after twenty-nine years of experience. We carefully figure the cost, add fixed charges and a reasonable profit, then sell at a price that is *fair* to both ourselves and our customers. The other way (more in vogue than you would suspect) is to fix the price first, then build the engine to *fit the price*. The former method results in quality, the latter—*not*. Over 100,000 users commend the "Otto" way.



OTTO GAS ENGINE WORKS, Phila., Pa.
STANDARD OF THE WORLD

MYERS POWER PUMPS

WITHOUT AN EQUAL ON THE GLOBE



OPERATING
WITH
GAS ENGINE

FIG. 952

HORIZONTAL BULLDOZERS, 3" to 6" CYLINDERS

MYERS
BACK GEARED
WORKING HEAD

TAPPED FOR
3" PIPE

5, 7½ and 10"
STROKE

FOR
BELT, WIND OR
HAND POWER

FIG. 1113

2½" DISCHARGE



BULLDOZER
WORKING
HEAD

PISTON COUPLING NUT

1½" BRASS ROD

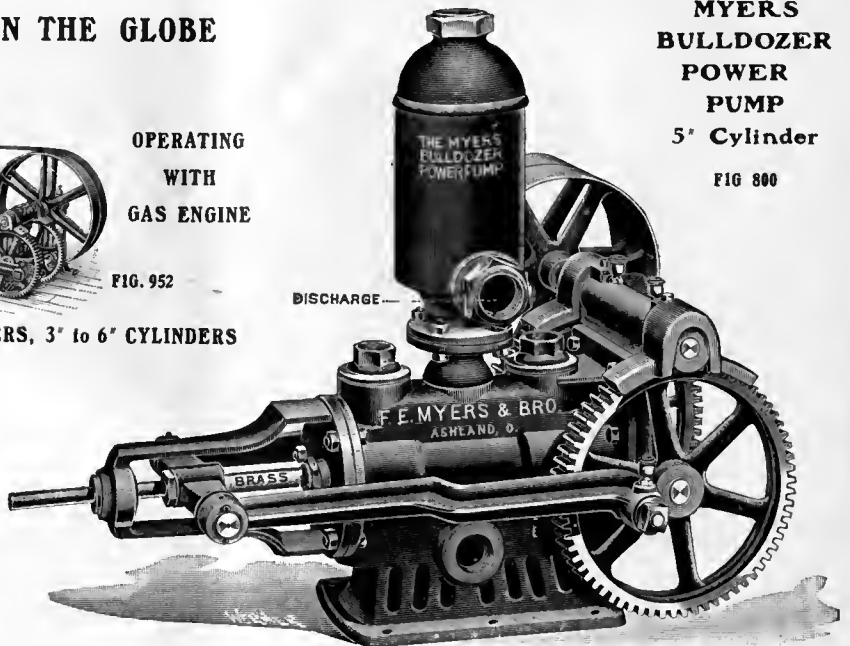
PIPE FLANGE



MYERS
BULLDOZER
POWER
PUMP
5" Cylinder

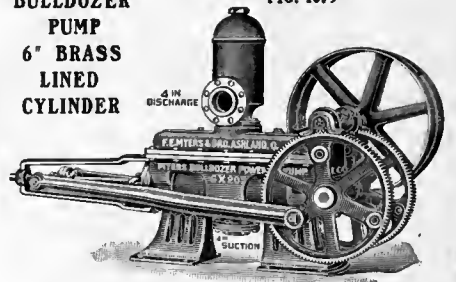
FIG. 800

DISCHARGE



BULLDOZER
PUMP
6" BRASS
LINED
CYLINDER

FIG. 1079



MYERS BULLDOZER
WORKING HEADS

No. 359

5", 7½", 10" STROKE

DISCHARGE, 2½ or 3 INCHES

SUCTION 2 to 4 INCHES

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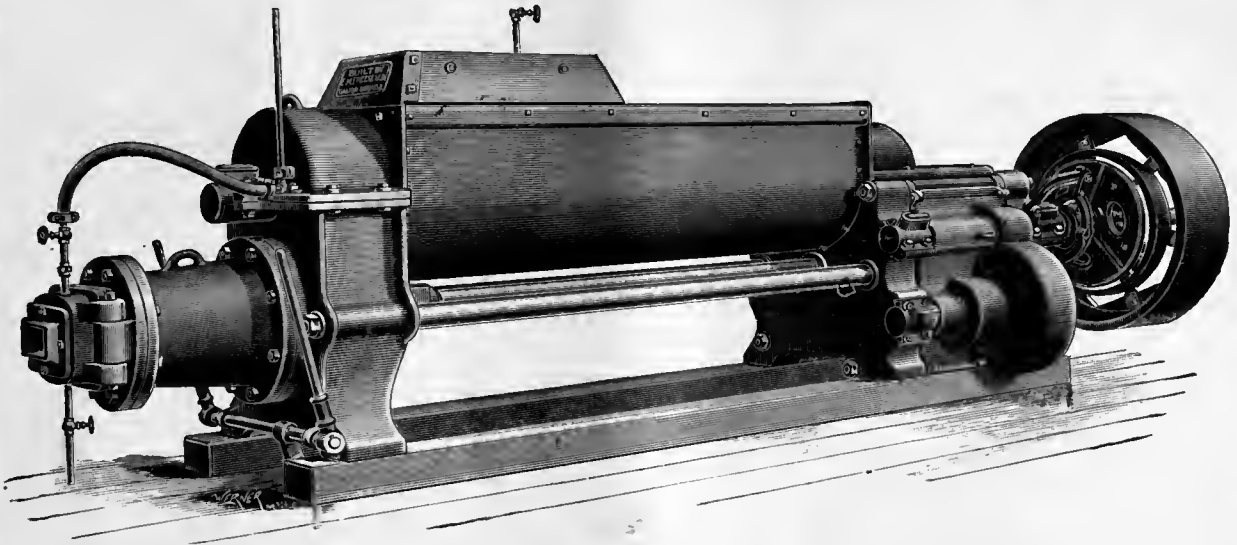
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You have to *harvest* it, before you get your profits.

And your profits now depend very largely upon the *way* you harvest it.

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It is a mighty poor policy to grow a good crop of grain and then let a part of it rot in the field.

It does not take a great deal of *waste* to eat up all your profits.

It may be only a spoonful of grain at a time but it counts.

Don't waste.

You can't afford it, and there is no necessity for it.

Get ready for a *profitable harvest.*

Do it now, while you have time.

Here is the way:

Go to an International Harvester Company of America dealer and ask him for a catalogue of the machine he handles.

He will be pleased to give you the book—and you will be pleased to get it.

He will be pleased to show you the machine—and you will be pleased to see it.

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We take it that you want a harvesting machine

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—that will be easy on your team.

—that you can get repairs for easily and quickly when you need them;

—that will, in short, give you thorough satisfaction in every way—doing for you everything that you can in reason expect a harvesting machine to do.

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Such facilities are made possible *only* through the co-operation of the manufacturers of these several lines of machines.

It is co-operation which enables them to produce from forest and mine their own raw materials—and thus be independent of uncertain and fluctuating markets. Acting together, they own, control and operate their own coal and iron mines, their own coke-ovens and steel mills, their own lumber camps and saw mills. They not only get their raw materials of first quality, but what is of equal importance they get them when they want them.

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Go to the dealer *now*, and get whichever catalogue you want.

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THE IRRIGATION AGE

VOL. XXI

CHICAGO, APRIL, 1906.

No. 6

THE IRRIGATION AGE

With which is Merged

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THE IRRIGATION ERA
ARID AMERICA

THE DRAINAGE JOURNAL
MID-WEST
THE FARM HERALD

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Kansas- Colorado Suit.

We are in receipt of a copy of abstract of the testimony of the Kansas-Colorado case. This was sent us by Prof. L. G. Carpenter, Ft. Collins, Colo., formerly state engineer of that State. This report will be gone into more fully in future issues of *THE IRRIGATION AGE*, and we will attempt to fully explain the situation in this famous case, using such illustrations as are necessary.

The Prairie Dog.

We are presenting in this issue an article on "The Prairie Dog" by Lieut. Tom Cooney, who has lived in the West for many years and who was on the engineering force of the Northern Pacific Railway when that road was built through North Dakota and Montana and on into the far West. Lieutenant Cooney was a close observer of the characteristics of that country and is preparing a series of stories on Western wild animals, which will appear in serial form in the columns of *THE IRRIGATION AGE*. This matter will no doubt prove very interesting to our many western readers.

Frank J. Bramhall.

We are presenting in this issue a half-tone portrait of Mr. Frank J. Bramhall, of the advertising department of the Southern Pacific Company, whose headquarters are at San Francisco: Mr. Bramhall is well-known in railway as well as irrigation circles and has a well developed ranch near Sacramento, Cal. Some

of the products of his ranch (pomelos, or grape fruit), are shown in connection with his photo.

Mr. Bramhall has written much of value on irrigation and has through his writings attracted attention to many of the Federal projects in the West. An article on "Irrigation in Nevada" from his pen appeared in our issue of January, 1906. It is our intention to publish other articles from his pen in future issues.

Forest King Pinchot.

To illustrate the feeling in Western States concerning the domineering tactics of the forestry division of the Department of Agriculture we quote from a letter dated March 17, written by the chairman of a prominent committee of the Legislature of the State of Wyoming:

"I am glad," says our correspondent, "at the manner in which you handle Maxwell and Forest King Pinchot; another Pinchot in Wyoming will drive the stock men and farmers to Canada and leave the State for a game preserve for the President, and the trees for Pinchot to play under."

This is one of many complaints which has reached us during the period of Mr. Pinchot's activity. Is this man as nearly perfect as he believes himself to be or as President Roosevelt would have us think?

Major Reed.

We are presenting in this issue a half-tone photo of the well-known western character, Maj. Fred B. Reed, of Burley, Idaho. Major Reed went into the West many years

ago and has been engaged in work of various character, including railway building, cow punching, sheep raising, and later as real estate agent and general boomer for the State of Idaho.

Major Reed is one of the energetic, forcible men of the irrigation empire, and is fully qualified to fill the position of general booster for the grand State of Idaho. He is at present booming the town of Burley and Cassia County, Idaho, and is closely identified with some heavier irrigation enterprises in that section of the State. He has frequently been mentioned for Congress from his Idaho district, and it is hoped that some day the people may realize his strength and value and send him to Washington to represent them.

The Major was born in New Jersey in 1858, was educated in the broad school of practical experience. He believes that irrigation is king, and that the land of the setting sun is the place to develop the human family to the highest standard of citizenship. Reed is more for the man in the breeches than the dollar in the breeches pocket.

Governor Pardee's Call.

THE IRRIGATION AGE has received recently a number of communications concerning the call issued by Governor Pardee to the Fourteenth National Irrigation Congress. This call was sent out to the members of the executive committee, honorary vice-presidents, etc., and is published in full in our article on Boise, Idaho, in this issue. The feature of the call which brought forth criticism is as follows:

"But the coming session will be, I think, of especial importance, for the reason that the system under which we are now working being on trial, those who are disposed to doubt its efficiency and question its results will be particularly active at this session to discredit it. Therefore, it behooves those who have faith in the final outcome of the system, and who desire to see it carried along the lines so successfully inaugurated, to be present at Boise, and, by taking part in the proceedings, do what they can to see that what has already been gained shall not be lost."

To the minds of many this indicates that officials of the Reclamation Service have secured the support of Governor Pardee to their cause. This is a wise move on the part of these gentlemen; it is moreover indicative of the good heartedness of the genial governor of California.

Governor Pardee, by the way, is as good a presiding officer as has ever held the chair during any of the past thirteen Irrigation Congresses. He is a man of splendid ability, wide experience, well informed on irrigation affairs, and withal, sympathetic; but we feel that the paragraph quoted above was written more by, and is a result of sympathy, rather than good judgment.

No one should criticise a man for doing that which is good, and THE IRRIGATION AGE is inclined to recognize and comment favorably upon all work accomplished by the Reclamation Service which is commendable. It may not be out of place to say, however, that it is equally ready to criticise errors in judgment or manipulation on the part of the officials of the Service.

It is perhaps permissible for Governor Pardee to shape the policy of the Fourteenth Congress. There can be no objection, to be sure, to a man of his position or prominence expressing an opinion as to the manner in which the Congress should be conducted. Nor can there be any objection to his apparent sympathy with the Reclamation Service. He has no doubt received much information concerning work of this service from officials and has, perhaps, not gone to the trouble to investigate complaints made by those whom the Service officials describe as soreheads, malcontents, etc., etc.

It may appear presumptuous on the part of THE IRRIGATION AGE to even criticise so distinguished a gentleman as Governor Pardee, and we wish it distinctly understood that we are not criticising him with the view of belittling the Congress or restricting the deliberations of that body.

It is, however, questionable if Governor Pardee exhibited reasonable caution in the paragraph quoted. In a communication to the governor on the subject, the editor of THE IRRIGATION AGE made the following inquiries: "Would it be out of place, Governor, to ask you to explain to us the above quoted extract. Are we to understand from this that those who attend the Congress are not to be permitted to express their opinion as to the manner in which work is conducted by the Reclamation Service, and is it to be understood that the men who are selected as delegates are to go there and pass resolutions laudatory of a service regardless of whether their opinions run along these lines or otherwise?"

"This particular paragraph which we have quoted and which is copied largely by papers throughout the Western States has a strange note, and the fact that one or two other members of the executive committee have forwarded clippings to us, and also informed us that they have received no notice of the Congress, nor have they been consulted in any way regarding the matter, gives the situation a strange aspect."

In reply to this communication the Governor, in his usual plausible way, "wishes to be permitted to say" that it appears to him that this paragraph needs no explanation, as it appears to be quite plain, and he can not understand why THE IRRIGATION AGE, or anyone else, should make inquiries of this character. He furthermore says that he can not see anything contained in his statement that would even suggest the questions asked by THE IRRIGATION AGE.

It may be possible that the glorious atmospheric conditions of Chicago permit one to read more deeply from the Governor's call than is possible under the conditions existing in the West—in California, for instance. It will require something more than the evasive answer of the esteemed Governor to convince us that his influence will not be used wholly or in great part during the session of the Congress to the purposes of the Reclamation Service and its officials; but while THE IRRIGATION AGE in no wise attempts to shape the policy of the Governor, nor would it criticise a plan of this character if carried out clearly and openly during the Congress, it still insists that the Governor has no right to attempt to shape the policy of this Congress by the means adopted in this his official call to that gathering.

It is reasonable to expect that Governor Pardee will question our right to criticise his position and he is at perfect liberty to do so. We, however, maintain equally as good a right to criticise as he has to suggest. It is doubtful if any move would have been taken at all in this Congress of a critical nature against the Reclamation Service, that is to say, the tendency among those who are following this situation closely, is to give the Service full credit and all the assistance possible, and it is doubtful if this call of the Governor's has been the means of stimulating the harmonious inclinations of those whom the Reclamation officials are pleased to term the mal-contents. In view of this, however, we still emphasize the fact that Governor Pardee is one of the best men who has ever presided at an Irrigation Congress and it is to be hoped that he may so govern his actions as to retain the good opinion and respect of the delegates.

ON BENDED KNEE.

Is This a Fair Sample of How the Reclamation Bureau Will Look After the Interest of Different Localities?

F. H. Newell, chief of the reclamation service, and N. E. Webster Jr., chief accountant, both having headquarters at Washington, visited the Truckee-Carson project last Sunday. These gentlemen are in close contact with "the power behind the throne" in matters relating to this project, and our citizens regret that they could not make an inspection tour of our great system, instead of a flying visit, as it were. With all due respect to the powers that be, it may be truthfully stated that there is a woeful lack of knowledge at Washington of the true conditions here; and this state of affairs will exist so long as the chief officials continue these fly-by-night excursions. It would certainly seem that the Government project rivaled at this time by the Panama canal only in importance should command more attention. *The Herald*, in perfect good faith, extends to Mr. Newell and his associates a hearty invitation to visit us again, and stay long enough to get an accurate personal knowledge, more to be depended upon than the tons of tabulated reports that have passed over their desks at Washington annually.—*Fallon (Nev.) Herald*.

EDITORIAL NOTES.

A YEAR ago President Roosevelt appointed the Reep commission to investigate business methods of various departments, and, where possible, cut out bureaucracy and red tape. Undoubtedly the commission has found its work extensive, and in some departments handicapped by attitudes of chiefs. It is unlikely that men of the Newell-Pinchot character will encourage effort directed in opposition to bureaucratic tendency, or admit of a necessity for improving the business of their departments. Their efforts have heretofore indicated a desire to hopelessly entangle the forestry and irrigation bureaus, and compel subordination of the land department. Hasty acquiescence on their part to executive plans is likely to include sinuous endeavor to deceive.

LAND COMMISSIONER ROSS, of Washington, at the last Irrigation Congress, challenged the assertion of F. H. Newell that red tape had been eliminated so far as the forestry division was affected. With specific claims for the school children of his State, he went to the national capital, where entrenched behind impassable red tape, sat the imperturbable Mr. Pinchot. Weeks of endeavor are fruitless when such systems and such officials dominate.

NOTHING appears to excite instant resentment of Reclamation officials like a suggestion to improve business details of the Service. Mr. Newell's interpretation of such a suggestion as an attack upon the President illustrates the far-fetched conclusions by which he hopes to divert attention from his department. How a proposition made by the National Irrigation Congress, along lines which the Reep commission is presumed to operate, can be interpreted as a "direct slap at the President" we trust Mr. Newell will elucidate.

PERHAPS the same authority can explain how an attack upon the character of a critic, can be constructed as answer to unselfish effort to protect the best interests of his community. Perhaps he can tell how impersonal correspondence to his department from citizens suggesting lines of policy and action, finds its way to local engineers, and is exhibited by them, only to men of known opposing sentiment, and the controverting argument is volunteered assertion that the critic is "a kicker" and "unpopular."

A DEPARTMENT of the United States Government, skirmishing under cover, to damage a citizen's character, that his logic may be unavailing, is an extraordinary condition. The Reclamation Service should come out in the open and give those whom it accuses an opportunity to answer. This covert assassination of ideas, of originality, of initiation by federal attaches, calls for Exec-

utive action. It is unjust to individuals, to citizenship, to the independent spirit which means so much to our country and the West. It places our nation in the cowardly role of principal or accomplice in abominable effort, and the accused is not permitted to defend his purposes or character.

WE MUST congratulate Engineer Field upon the originality of his conception (a plan practiced by his kind ever since the world began). We congratulate the coterie of hangers-on, who profit by selling supplies at increased profit, or purchase slightly damaged government plunder for a song.

ALL of which might suggest to the Reep commission a line of inquiry. All of which indexes reasons for creating a business bureau for the Reclamation Service, even though in so doing, it may be necessary to reduce the imaginary dimensions of half a dozen craniums.

FOR the appropriate consideration of the Reep commission we commend that the expenditure of \$30,000,-000 in public works, needs trained business specialists to observe economy and avoid mistakes. Mr. Newell and his engineers can well devote their time to transits and computations. Projected plans should by them be reported. So many yards removal will water approximately so many acres of land; so much additional removal will add so many more available acres.

THE business bureau can then take up the part of feasibility, the purchase of equipment and supplies, and the disposition of damaged or obsolete materials, the contracts, and other details.

SINCE the last National Irrigation Congress, where the National Irrigation Association was formally repudiated, that institution has been shifting the fields of its exploitation. A loss of prestige in the West has necessitated a search for new and greener pastures. Evidences of migration are manifest in several ways. THE IRRIGATION AGE, which had the temerity to attract attention to some peculiar mannerisms of Mr. Maxwell, has already felt the pressure of southern railroad influence.

WESTERN railroads have discovered impelling motives of the combination, and have ceased to yield liberal donations. Chill and frost have sent the "Byrd"-lings to the sunny South. So long as this new field will feed, all will be well, but when thoroughly milked, the deserted rural districts of New England, which now are passing into hands of obscure syndicates, will be ripe for exploitation. Thus 'round this little world this system moves.

WILLIAM E. SMYTHE, whom we imagined, and fondly hoped, was loyal to his own famed commonwealth and to the West, has recently (unwittingly perhaps) devoted laborious endeavor to this exploitation, by extended statements in Maxwellian publications. He may be blameless, and the South may see an opportunity for judicious advertisement. Occasion for censure lies in the fact that under the name of irrigation the malpractice operates; the name was chosen for piratical purposes, intended to confuse and take all creditable influence of the National Irrigation Congress, for its own legitimate spoils.

JUST now the light-weight roysterer—the hot air merchant of the *Talisman*—is yapping vigorously at President Roosevelt. A layman wonders if in his vain-glorious imaginings he thinks that scaling eminence will render a pygmy more conspicuous, or that his ozone consumption and idiotic challenge will attract the President's eye.

THE manner of its presentation cannot fail to neutralize his argument. With head-lines indicating blatant ambition, the effect of logic fails. Corporations are showing evidences of floundering when they continue in supporting contributions to self-exploitation.

PERHAPS assurance of entrenchment in branches of the Interior Department, or over-confidence that reiterated lavish compliment will blind the Honorable Secretary, yields an anticipated immunity from disaster from that source; and again perhaps he sees inevitable a clearer atmosphere in forestry and reclamation circles, which even the fogs of his begetting will not hide, which consciousness impels aggressive attitudes, trusting for ample berth in his Master's mansions. What is to become of Frederick, and his other pliant tools, is their affair.

SENATOR CARTER KNOWS HOW.

According to the *Washington Post*, Senator Carter is in a fair way to accomplish the settlement of the Milk River irrigation problem. The *Post* says:

"When Senator Tom Carter of Montana goes after a thing he usually gets it. His latest achievement, accomplished in spite of the opposition of the Secretary of the Interior, is the promise for the construction of a work that will irrigate and redeem more than 100,000 acres of the public domain in his State and create new homes to which settlers will be invited. How "Tom" Carter overcame his difficulties is an interesting incident.

"There is a small lake in Montana known as St. Mary's, the waters of which through a stream empty into Canadian territory. Milk River, in Montana, also

flows into Canadian territory and then turns back into the United States.

"Senator Carter wanted the Interior Department to divert the waters of St. Mary's lake into the Milk River, so that it could be utilized for irrigation purposes, but the secretary, after investigating, declined on the ground that past experience had shown that the Canadians had utilized the waters of all the streams flowing from American territory into their domains and that if this work were done it would be solely for the benefit of the Canadians, who probably would not permit the waters to flow back undisturbed. The estimated cost of the project is \$600,000, and this was too much to invest on a questionable transaction, from the secretary's viewpoint."

The senator then took the matter up with the director of the geological survey and the assistant Secretary of State with the result that it is now proposed to cut a new channel through a low range of hills for the waters of St. Mary's lake which will keep all of the water of Milk River on this side of the international boundary. It is estimated this can be done for \$600,000.

HAS IRRIGATION RETURNS.

O. L. Waller Learns Value of Foot of Water—Compiling Results in this State for the Agricultural Department.

O. L. Waller, professor of civil engineering at Washington State College, Pullman, is at the Victoria hotel en route home from a trip through the State, during which he was getting figures on the value of an acre foot of water. This information is being compiled in the State of Washington for the irrigation division of the Department of Agriculture. Said Mr. Waller:

"An acre foot of water is a volume of water one foot in depth that would cover an acre of land. In my investigation I am learning for the Government what monetary returns have resulted from a foot of water put on land that is irrigated.

"On my present trip I have been investigating the Spokane valley returns. I have also investigated the returns from different crops grown in the Yakima valley and elsewhere in the State.

"I found that an acre foot of water on Mr. Calister's land at Greenacres netted \$240, the land being tomato land. The total result from the acre was \$350, but eighteen inches of water were used.

"In the Yakima valley I found an acre of potato land that yielded more than \$90 to a foot of water. In four or five places in that valley I found a foot of water brought eight and a quarter tons of alfalfa to the acre, and alfalfa in the stack is worth \$5 a ton. I found a half acre of Spitz apples, 40 trees, that yielded \$350.

"In making these reports I include the natural precipitation in the estimates. For instance, in the Spokane valley last June there was a precipitation of five inches, almost as much as the rainfall of an entire year in the Yakima country."—*Spokesman-Review, Spokane.*

BLOCKS PRIVATE IRRIGATION.

"Relations between the water consumers of the Yakima country and the Reclamation Service are becoming more strained every day," said Manly B. Haynes, secretary of the Hanford Irrigation and Power Company, who returned from Priest Rapids yesterday, says a recent issue of *The Post Intelligencer*, Seattle, Wash. "There seems to be no possibility at the present time of an adjustment.

"It is an outrage the way the water consumers are being treated by the Reclamation Service. Private irrigation projects that were turned down by the Government before they were taken up by private interests are now being blocked by the engineering parties sent out by the Government. It is impossible to tell where the Reclamation Service proposes to carry on irrigation work, and it is impossible for private interests to carry on their projects until this is definitely known.

"The Reclamation engineers have just invaded the Priest Rapids country, where the Hanford Irrigation & Power Company was preparing to commence the construction of canals, laterals and a power plant to water 32,000 acres of rich lands near Priest Rapids, on the Columbia River. More than a year ago the Reclamation Service investigated the Priest Rapids scheme, but pronounced it too small. After the proposition had been rejected by the Government it was taken up by our company, and we have the money on hand to carry out the work during the present low-water period.

"After the Hanford Irrigation & Power Company has gone into the Priest Rapids country and expended considerable money in preliminary work, and made application for the release of 18,000 acres of Northern Pacific lands, the reclamation engineers do everything in their power to block the enterprise. So far the reclamation agents have succeeded in having our application for the release of the Northern Pacific lands held up, and at present it looks as if we would be delayed at least a year in carrying out the work planned.

"The invasion of the Priest Rapids country not only prevents the Hanford Irrigation & Power Company from continuing its work, but puts a stop to other important projects in the same locality. A. Morrissey has expended \$10,000 in building a canal and doing other work to reclaim 8,000 acres of arid lands on the east side of the Columbia River, near Priest Rapids, and by the invasion of the reclamation engineers his project is blocked, as the application for the release of these lands has also been held up at the request of the reclamation people.

"Under an agreement entered into more than a year ago the railroad company has agreed not to sell its lands to individuals or companies in the districts where the Reclamation Service contemplated the construction of government irrigation works. This successfully ties up any private projects that the reclamation Service may desire to block."

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CHICAGO MONEY CENTER FOR IRRIGATION ENTERPRISES.

Chicago banks are financing all the enterprises under private control for reclaiming the arid regions. A writer in the *Chicago Journal* of recent date says:

"In the gigantic movement under way for the reclamation of the arid regions of the West—the breathing of life into a new country—Chicago looms up as the foster mother of irrigation.



Mr. Frank J. Bramhall, of the Southern Pacific Railway, San Francisco.

"The West is looking, and has looked since the birth of private irrigation enterprises, to Chicago for its money. Those close to the interests of the West say that in the last two years millions of dollars secured in Chicago has allowed private and independent companies to profit by the experience of the Government in reclamation work and become pioneers in the task of converting dry, virgin cactus-bearing desert into fertile farm lands, well watered and bearing abundant crops.

"Chicago financiers more than those of any other city are financing the irrigation enterprises. Both private companies and municipalities look upon this city as the great money center whose wealth shall make the desert bloom. What Pittsburg was to the development of the oil fields, what Boston was to copper, and what New York became to iron, cotton and transportation, Chicago has become to irrigation enterprises. Not an irrigation scheme is launched in the West until Chicago financiers are consulted on the money side of it. Boston and New York handle some of the irrigation bonds, but financiers there know that the enterprise has the approval of some reputable Chicago house, and that Chicago money is the money behind the new West. Only after the irrigation enterprises have received the approval of some reputable Chicago house will an eastern financier touch the Western securities.

"Millions of acres of Western lands have been watered and settled with the money furnished from this city. The benefit to Western States has been almost incalculable. They have become richer by several million dollars. By one venture alone, one of the first financed by Chicago, eight or ten millions were added to the property valuation of the State of Idaho. This venture was the reclamation of 120,000 acres of sage

brush land into one of the most fertile portions of the West in the Twin Falls region.

"Chicago furnished \$600,000 for this enterprise. Six to eight thousand people rushed into the region and became landowners. In Cassia County three towns sprang up like magic, the largest, Twin Falls, with a population of 2,000. A branch of the Oregon Short Line was constructed, tapping a region of 700,000 acres. The accomplishment of the settlers surprised even themselves. It was only 100 days from the time the sage brush disappeared until the first crop of grain was harvested.

"Many other such instances can be counted throughout the West. On the other hand, however, many failures have followed private organization. These, almost without exception were fostered by 'wildcat' promoters who had no fitness whatever for the development which they promised, and in many cases there was no intention of good faith. It is against the prejudice and havoc resulting from these fake enterprises that promoters of legitimate schemes have to work.

"Investors who have been 'bitten,' however, are gradually availing themselves of the safeguards which sound financial backing assure. With the Chicago stamp on it, an irrigation project is taken to be the best there is. Several Chicago concerns have made a specialty of the financial end of irrigation enterprises and have trained and capable field lieutenants who make surveys and go into titles and grants. Chicago bankers



Major Fred R. Reed, "The Sage of the Sage Brush," Burley, Idaho.

realize the enviable position they have attained and are zealously guarding the city's reputation, lest unscrupulous promoters locate here. Publicity is the poison given to fake schemes.

"There has been much friction between promoters of private enterprises and the reclamation agents of the United States Government. It is expected, however, that disputes will work out satisfactorily in the end. The private companies assert that the Government has taken lands which ought to be left to private development. The promoters want the Government to reclaim lands which otherwise would go to waste entirely.

"Bankers and capitalists of other cities now fully realize that Chicago virtually controls the western money situation so far as the big land enterprises are concerned. Tens of millions of dollars will go from this city into the great irrigable section of the country and the most conservative bankers declare that this new outlet for Chicago energy and Chicago capital will do more than anything else to raise the city to a still higher financial position."

BEAUTIFUL BOISE.

The Next Meeting Place of the National Irrigation Congress—The Date Decided on Is Sept. 3-8, 1906.

In view of the fact that the Fourteenth National Irrigation Congress is to be held at Boise, Idaho, September 3d to 8th, this year, it is considered well to give our readers a general idea of that city and its surroundings.

Boise, as is well known, is the capital of that progressive State of Idaho, which has, perhaps, as good a chance for irrigation development as any single Western State; in fact up to this time more work has been accomplished in Idaho under private projects than any other section of the West, since the passage of the reclamation law. Large areas of this State, much of the land contiguous to Boise, is also to be irrigated under the Reclamation Act, and when these two classes of



A Western Landscape.

GRAFT AND WATER.

The natural irrigation fund has several fingers of graft mixed up inside of it and Oregon and Washington projects in consequence are held up pending the elimination of the pap tubes through which the leakage is running. It is refreshing to know that the graft has been discovered before the many millions of the fund disappeared entirely, and it is further a source of no little gratification to feel that perhaps the great great grandchildren of the present generation may possible receive a little benefit from the fund if it holds out that long. With the graft and red tape of government irrigation projects eliminated, something might be done, but it begins to look as if there would be mighty few rose-tinted skies to beam on those who, in the midst of immense desert regions, fertility undisputed, are watching and waiting for Sam's jack pot of many millions to be amicably divided among the long fingers at present dabbling with it.—*Journal*, Pineville, Ore.

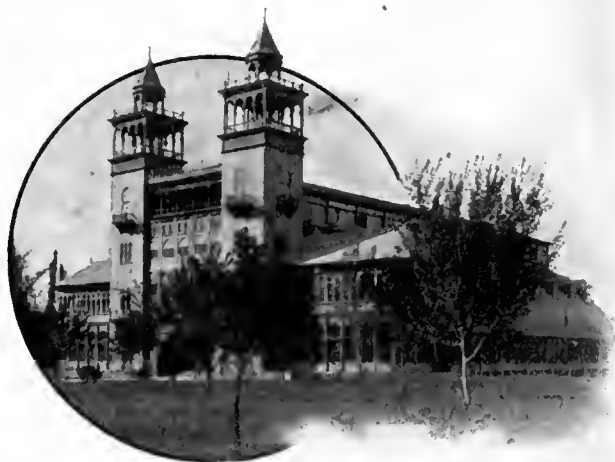
work are completed this State will unquestionably rank with the very best irrigated sections in the world.

The phenomenal growth of the city of Boise, which is the metropolis of the State, in the five years since the census was taken, is due to the fact that natural resources, with the push, energy and wealth of its citizens, has brought her to the front to become, at no distant day, the unrivaled commercial mart of the great inter-mountain empire, lying between Portland, Ore., Salt Lake City and Ogden, Utah. That this is Boise's destiny is evident to all who have studied her and the country surrounding, and who have a fair knowledge of the agricultural, mineral and timber possibilities of that State.

The population of the city of Boise has increased from 5,957 people in 1900 to upward of 16,000 people at the present time. This city was founded in 1863 from the overflow of the famous Boise Basin Mining District, and it subsequently became the mart for a wide expanse of rich territory, and has grown with the development of the surrounding country and attracting to her limits and environments successful people of that State in all avenues of life, many of whom have built palatial homes, and are thereby aiding materially in beautifying the city.

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Another fact concerning Boise of paramount importance is the salubrity of its climate. Perhaps no section of the West has a more even or healthful climate than is enjoyed by this particular section of Idaho; and it is on that account that Boise is visited by large numbers of tourists during the winter months, and is made the home of many from the central and eastern States who are unable to stand the rigorous winters of their respective home states. It must not be under-



The Natatorium, Boise.

stood by this that Boise, like many of the western and southern health resorts, is a sort of hospital town; on the contrary it is very much of a home town, and one sees very little, if any, indication of tuberculosis or other patients that make conditions depressing in what are known as purely health resorts.

Boise contains as many active business men, perhaps, as any city of its size in the United States. She has a business organization known as the Commercial Club, which is the outgrowth of the Boise Chamber of Commerce, and this organization is officered by men of well known business ability, integrity and push.

We are presenting in this connection a large number of half-tone portraits illustrative of Boise, which



Ranch Near Boise.

will give our readers a better idea of this charming city, which we all hope to visit in September.

The Commercial Club of Boise, and citizens generally, are working to make the Fourteenth National Irrigation Congress the best meeting held by that body since the famous Congress engineered by the Hon. Fred Kiesel at Ogden, Utah, three years ago.

The officers of the Fourteenth National Irrigation Congress are as follows:

Hon. George C. Pardee, President.....Sacramento, Cal.
L. W. Shurtliff, First Vice-President.....Ogden, Utah
J. H. Stephens, Second Vice-President.....Vernon, Texas
E. L. Smith, Third Vice-President.....Hood River, Ore.
Monte B. Gwinn, Chairman Executive Committee, Boise, Idaho
C. G. Jones, vice-chairman.....Oklahoma City, Okla.
H. B. Maxson, Secretary.....Reno, Nev.
W. T. Booth, Assistant Secretary.....Boise, Idaho

HONORARY VICE-PRESIDENTS.

Alabama.....J. B. Shivers, Marion, Ala.
Arizona.....Dwight B. Heard, Phoenix, Ariz.
Arkansas.....J. A. Van Etten, Little Rock, Ark.
California.....W. E. Smythe, San Diego, Cal.
Colorado.....Frank B. Goudy, Denver, Colo.
Connecticut.....S. C. Dunham, Hartford, Conn.
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District of Columbia.....William Tindall, Washington, D. C.
Florida.....John H. Stephens, Jacksonville, Fla.
Georgia.....D. G. Purse, Savannah, Ga.
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Iowa.....W. C. Howell, Keokuk, Iowa
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Kentucky.....W. C. Nones, Louisville, Ky.
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Maine.....Frederick Robie, Portland, Maine
Maryland.....Richard H. Edmonds, Baltimore, Md.
Massachusetts.....Herbert Myrick, Springfield, Mass.
Michigan.....W. A. Smith, Grand Rapids, Mich.
Minnesota.....John A. Stees, St. Paul, Minn.
Mississippi.....T. A. Catchings, Vicksburg, Miss.
Missouri.....Thomas T. Crittenden, St. Louis, Mo.
Montana.....Alf. Decker, Red Lodge, Mont.
Nebraska.....F. M. Rathbun, McCook, Neb.
Nevada.....G. S. Nixon, Winnemucca, Nev.
New Hampshire.....F. W. Rollins, Concord, N. H.
New Jersey.....C. S. Lee, Plainfield, N. J.
New Mexico.....J. D. Tinsley, Mesilla Park, N. M.
New York.....Wilbur F. Wakeman, New York, N. Y.
North Carolina.....Dr. C. W. Burkell, West Raleigh, N. C.
North Dakota.....N. G. Larimore, Larimore, N. D.
Ohio.....J. A. Jeffrey, Columbus, Ohio
Oklahoma.....J. S. Cormack, Snyder, Okla.
Oregon.....R. E. Judson, Portland, Ore.
Pennsylvania.....J. H. Kurtz, Ephrata, Pa.
Rhode Island.....Oscar Lapham, Providence, R. I.
South Carolina.....J. J. Gentry, Spartansburg, S. C.
South Dakota.....A. W. Ewart, Pierre, S. D.
Tennessee.....George R. James, Memphis, Tenn.
Texas.....J. H. Stephens, Vernon, Texas
Utah.....L. W. Shurtliff, Ogden, Utah
Vermont.....W. J. Van Patten, Burlington, Vt.
Virginia.....Hon. Joseph Bryan, Richmond, Va.
Washington.....Hon. A. E. Mead, Olympia, Wash.
West Virginia.....A. B. White, Charleston, W. Va.
Wisconsin.....W. W. Potter, Chippewa Falls, Wis.
Wyoming.....Clarence T. Johnston, Cheyenne, Wyo.



Sixteen Bears Killed by One Man in Six Weeks.

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The Executive Committee is as follows:

Alabama.....	Eugene A. Smith, University, Ala.
Arizona.....	B. A. Fowler, Phoenix, Ariz.
Arkansas.....	W. S. Mitchell, Little Rock, Ark.
California.....	H. D. Loveland, San Francisco, Cal.
Colorado.....	Arthur F. Francis, Cripple Creek, Colo.
Connecticut.....	W. A. Kelsey, Meriden, Conn.
Delaware.....	Edward Jenkins, Dover, Del.
District of Columbia.....	E. T. Perkins, Washington, D. C.
Florida.....	J. D. Calhoun, Tampa, Fla.
Georgia.....	B. M. Hall, Atlanta, Ga.
Idaho.....	A. B. Moss, Payette, Idaho
Illinois.....	D. H. Anderson, Chicago, Ill.
Indiana.....	Cortez Knight, Marion, Ind.
Iowa.....	H. C. Wallace, Des Moines, Iowa
Kansas.....	Otis L. Benton, Oberlin, Kas.
Kentucky.....	C. F. Huhlein, Louisville, Ky.
Louisiana.....	Charles K. Fuqua, Baton Rouge, La.
Maine.....	Arthur C. Jackson, Damasiscotta, Maine
Maryland.....	C. W. Beek, Baltimore, Md.
Massachusetts.....	J. M. Chapple, Boston, Mass.
Michigan.....	W. K. Morley, Grand Rapids, Mich.
Minnesota.....	John McAlpine, Duluth, Minn.
Mississippi.....	Charles Scott, Rosedale, Miss.
Missouri.....	Mathias Schuler, St. Louis, Mo.
Montana.....	Herbert Strain, Great Falls, Mont.
Nebraska.....	G. L. Shumway, Scotts Bluff, Neb.
Nevada.....	E. L. Williams, Reno, Nev.
New Hampshire.....	E. Bertram, Pike, N. H.
New Jersey.....	H. H. Rollies, Hoboken, N. J.
New Mexico.....	L. Bradford Prince, Santa Fe, N. M.
New York.....	Truman G. Palmer, New York, N. Y.
North Carolina.....	George F. Weston, Asheville, N. C.
North Dakota.....	E. F. Chandler, University, N. D.
Ohio.....	F. E. Myers, Ashland, Ohio
Oklahoma.....	C. G. Jones, Oklahoma City, Okla.
Oregon.....	F. S. Stanley, Portland, Ore.
Pennsylvania.....	W. H. Krips, Philadelphia, Pa.
Rhode Island.....	A. J. Utley, Providence, R. I.
South Carolina.....	W. D. Morgan, Georgetown, S. C.
South Dakota.....	Wesley A. Stuart, Sturgis, S. D.
Tennessee.....	Irby Bennitt, Memphis, Tenn.
Texas.....	John Hall, Lampasas Springs, Texas
Utah.....	Fred J. Keisel, Ogden, Utah
Vermont.....	N. G. Williams, Bellows Falls, Vt.
Virginia.....	Judge W. H. Bond, Wise, Va.
Washington.....	George E. Dixon, Ellensburg, Wash.
West Virginia.....	J. C. Brady, Wheeling, W. V.
Wisconsin.....	A. J. Cobban, Madison, Wis.
Wyoming.....	F. S. Price, Caspar, Wyo.

those who attend may rest assured that ample accommodations will be afforded for all, and that the prices will be moderate. It is not the intention of the citizens of Boise to play a hold up game with the delegates; in fact the citizens of that city have raised a fund of something like \$5,000 with which to defray the expenses



Baptist Church, Boise.

of the Congress and further entertainment of the delegates and friends who attend.

Governor Pardee, of California, who is president of the Congress, has recently sent out the following notice to all of the state vice-presidents and members of the executive committee, and these gentlemen are ex-



Idaho Prunes.



Pettit Lake, near Boise.

Our readers may write to any of the above general officers or executive committee for additional information concerning matters to be discussed at the Congress.

Mr. Monte B. Gwinn, chairman of the Executive Committee, whose home is at Boise, and Mr. W. T. Booth, assistant secretary, Boise, who was also president of the Boise Chamber of Commerce, are actively engaged in the work of exploiting this meeting, and

pected to do all in their power to further the interests of the Congress:

SACRAMENTO, CAL., February 23, 1906.

Dear Sir—I am informed that the Executive Committee, Hon. Monte B. Gwinn, chairman, of the National Irrigation Congress, has set September 3-8 for the date of the meeting

of the Congress this year. The place, as you know, is Boise, Idaho.

All sessions of the Congress are, of course, important events in the history of the irrigation in this country. But the coming session will be, I think, of especial importance; for the reason that the system under which we are now working being on trial, those who are disposed to doubt its efficiency and question its results will be particularly active at this session to discredit it. Therefore, it behooves those who have faith in the final outcome of the system, and who desire to see it carried on along the lines so successfully inaugurated, to be present at Boise and, by taking part in the proceedings, do what they can to see that what has already been gained shall not be lost.

May I, therefore, request that you take the matter up with the governor of your State and with the public and semi-public bodies who, under the constitution of the Congress, are entitled to representation, and see to it that delegations as large and influential as possible be accredited from your State?

I realize thoroughly that many of our States have no direct interest in irrigation. But when it is considered that those States which are not directly interested are the most densely populated parts of our country and that, therefore, it is necessary to find homes for coming, even present, generations upon the land, if our cities are not to become too powerful as compared with the country, it will be seen that every State in the Union has, at least, an indirect interest in making possible the irrigation of these millions of arid acres, which, without irrigation, are of little use, but which, with irrigation, will accommodate, in prosperous homes, many millions of American families. The general prosperity of our country also depends, I think, in a great measure upon there being a prosperous and dense rural population, rather than upon our population being confined to large cities. It is to the interest of every State, therefore, to do what it can to have our country lands as densely populated as may be.

Therefore, I hope you will be able to arouse sufficient interest among your people to assure a large, active and enthusiastic delegation from your State at the next session of the National Irrigation Congress at Boise next September.

Very truly yours,
GEO. C. PARDEE,
Governor of California and President of the National Irrigation Congress.



Carnegie Library, Boise.

While some slight objection has been taken to the wording of Governor Pardee's official call, this fact will in no wise dampen the enthusiasm of the members of the committee, nor others interested who are pledged to make this Congress a success in every way.

The hotel accommodations at Boise are ample, and we are showing in connection herewith a half-tone cut of the famous Idan Ha Hotel of that city, which will be the headquarters of delegates during the Congress.

THE IRRIGATION AGE has made arrangements for ample space on the parlor floor of this hotel where it hopes to entertain its many friends during the Congress. We will publish from month to month a report concerning the work done in behalf of this meeting so that our readers may be thoroughly informed and become better acquainted with the city and its hospitable citizens before the Congress convenes.

In conclusion we would suggest that every member of the committee and vice-presidents from each State take active part in assisting the Boise people. It would be well for each and every one to "Boost for Boise."

IRRIGATION IN WESTERN KANSAS.

BY CHARLES ALMA BYERS.

Western Kansas is to have an irrigation system unlike that of any other district in the United States. In fact, it has had such, on a small scale, for several years. The Government, however, has recently promised to come to its assistance, and in consequence the western part of that State or, to be more definite, the vicinity



Soldiers' Home, Boise.

of Garden City, is to have an irrigation system supplied with water from a series of wells—the only system of the kind in this country, except the small ones owned by individuals in that vicinity and in certain parts of Texas, for the irrigation of their own land.

This system is designed to furnish water for 10,000 acres of uplands, but its capacity will be considered at about 15,000 acres. The total estimated cost to the Government of putting the system in operation is \$250,000, and the Secretary of the Interior last October, acting upon the report of Prof. C. S. Slichter, consulting engineer, ordered that the United States Reclamation Service set aside this amount from their \$30,000,000 fund to carry out the work. The Govern-

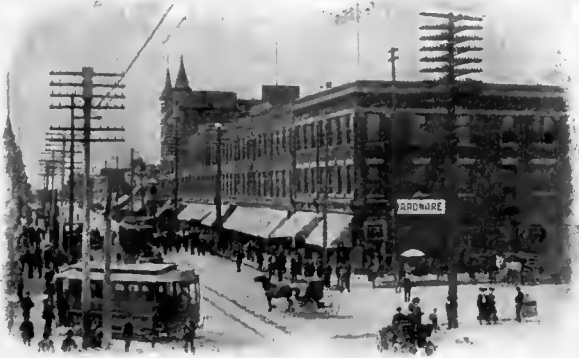


Orchard Near Boise.

ment is to control the system for ten years, at the end of which time it becomes the property of the Finney County Water Users' Association, an organization composed of the owners of the land to be irrigated. In the meantime the land owners will be under contract

to pay at the rate of \$25.00 per acre for the service, or \$2.50 per year for each acre of land owned, and the cost of maintenance, which is not to exceed \$2.00 per acre. At the end of the ten years the entire plant is to be turned over to the association without charge and in perfect condition. No tract of land owned by any one person exceeding 160 acres is to be admitted to the service—a restriction placed by the Government to bar speculators.

The system is to be supplied with water from 230



Block on Main Street, Boise.

wells, which will be divided into twenty-three groups. Of each group nine wells are to be sunk to a depth of sixty feet and one to a depth of 300 feet. The average depth at which a strong underflow of water is found in this vicinity is six and one-half feet, but by sinking the wells to the depths proposed they will also serve as reservoirs and thereby insure reliable service. The area is underlaid with sand and gravel to a great depth, and therefore the sinking of the wells will be no very difficult task.

Each of the twenty-three groups, comprising ten wells, will be supplied with a pumping station, each arranged so as to be operated independently, and each discharging its water into a concrete-lined flume, or



Residence of H. B. Eastman, Boise.

surface conduit. There will be a central power station, located about the middle of the line of pumping plants, from which the power will be distributed electrically and independently to operate each plant. The central power station is proposed to develop 750 brake horsepower from gas engines, which will use producer gas for fuel. The gas engines will be divided into three units each of 250 horsepower, connected directly with

175-kilowatt, compound wound, direct current generators of 550 volts and 225 r. p. m. At each pumping plant there will be a 25-horsepower motor of ordinary series, connected directly by vertical shafts to centrifugal pumps, both motors and pumps being provided with automatic oilers. Concrete buildings will house each of the pumping stations and the central power plant.



St. Alphonsus Hospital, Boise.

The area to be irrigated, being uplands, or second bottoms, is from thirty to fifty feet above the bed of the Arkansas River, which flows through the district, and on this account it is necessary to carry the water, or a portion of it, for considerable distance to get sufficient fall. In fact, about half of the wells will be located on the side of the river opposite the land to be irrigated. A concrete conduit will carry the water from the pumping plants to the ditches, and at the point



St. Teresa's Academy, Boise.

where it is to cross the river an inverted siphon of 800 feet in length will be constructed also of concrete so as to carry the water beneath the river's bed. The total length of the concrete conduit, from the farthest-most well to where it empties in the lead ditch will be 2,400 feet, and the average fall for the distance is two and one-half feet per mile.

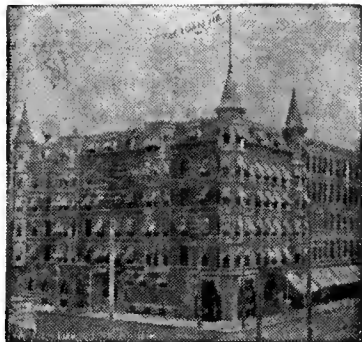
Careful tests of the wells owned in this vicinity by



St. Luke's Hospital, Boise.

individuals and of temporary pumping plants show that there need be no fear but that the system will be amply watered. The specific capacity of each square foot of well strainer can be reliably estimated at 0.25 gallons of water per minute. At this rate each well under a ten-foot head sunk to a depth of sixty feet would yield over 400 gallons per minute; or if under a fifteen-foot head, as is proposed, there would be a yield from each

of 600 gallons. Following this computation, and assuming that all of the 230 wells are to be only sixty feet deep, it is seen that the total output of the well should be 138,000 gallons of water per minute—which is considered a very conservative estimate. Some of the wells tested have been in use for more than five years and in that time they have shown no decline from the original capacity.



Idan-Ha Hotel, Boise.

The tract of land which is to be irrigated in this unusual way has heretofore been practically valueless for the reason that it had no water. It is known, however, to be a very fertile soil, and when the system is put in operation it is expected to produce large crops. The owners of large tracts, in fact, have already put it to the test by installing private systems, and it has been found equal to expectations. The Arkansas River, which passes through the region, is not at all reliable, since it is subject to a very uneven flow, and furnishes scarcely water enough to water the first bottoms, which ordinarily require very little. The area's best paying crop is sugar beets, and the new irrigation system, which is to be in operation within a year from the coming spring, is expected to greatly increase the acreage of Western Kansas.



Residence of William Howell, Boise.

This system is to serve as a precedent for several others of the same kind. Much of the western lands which are now barren have not river water sufficient to supply irrigation systems, and where it is to be found beneath the surface as in Western Kansas similar plants will some day be installed. It is even probable that in time some of the old river systems will be thus replaced. Some of them already show signs of failing, and on this account the experiments of Western Kansas are being eagerly watched.

Send \$2.50 for The Irrigation Age
1 year, and The Primer of Irrigation

THE PRAIRIE DOG.

BY LIEUT. TOM COONEY.

His name is a misnomer, as there is nothing canine about the little frontiersman.

He keeps good hours—*daylight*—is a vegetarian, pure and simple, gregarious, living in large "towns," and even extends hospitality to those not of his kind, notably the little burrowing owl and the rattlesnake.

This lack of exclusiveness is detrimental to his reputation, as some of his associates are no better than they should be.

As to his looks: Take a woodchuck three-quarters grown, give him a yellowish grey coat, with a suggestion of red, a short tail, slightly roached to the tuft, short ears, full, round eyes, the four front teeth prominent, and you have the prairie dog or marmot of the plains.

During the summer he so combines profit with pleasure, that, when the plains are swept by winter, he has retired on an ample competency—fat—and never lets the roaring storms disturb his dreams of spring and warm chinooks.

It is my belief, based on many years' observations, that the prairie dog only tolerates one of his lodgers—the rattlesnake—because he can't help himself. Know-



Methodist Church, Boise.

ing the dog keeps open house, the snake is self-invited and makes good his welcome on his reputation of being "bad."

But the dog and the owl are boon companions. I've spent many an hour watching the two, sitting cheek by jowl, for all the world as if the owl were relating some rakish exploit of the night before, and enjoying the wonder in the round eyes of his credulous and unsophisticated landlord.

A widespread belief obtains that in every "town" one burrow goes down to water, making a "well"—the village pump, so to speak.

It is the exception, however, to find a town near water, and the nature of the site, for the most part, precludes the possibility of the "well."

The idea is doubtless grounded on the error that all animals must have water, but it is a fact that many wild animals never use it, although in captivity drink becomes a necessity.

This is true of many birds, and a vast army of small quadrupeds, more particularly those of arid regions. Coming under our immediate observation are the field-mice, the ground and timber squirrels and some grouse.

These, in a natural state, have no requirement for water, but interfere with their mode of living, and the "drink habit" is engendered.

It is not generally known that the prairie dog migrates. He certainly does, and a la defaulting cashiers, between two days.

Why they migrate is not due to lack of food or molestation. It may be that sanitary conditions demand a change, or that the inhabitants "see snakes" too often, these being more numerous in *dead* than in *live* towns. But the owls follow the dogs.

A strange spectacle could we but witness it: This dog army hurrying along in the darkness, followed by their little, winged friends, all eager and fearful, trying to make the promised land, and get underground before daylight, and what a thrill pervades the ranks when from some nearby hill the coyote's shriek is heard!

Often these journeys cover several miles, and the new home, suitable to requirements, may be hidden from the old country by intervening hills.

up a constant yipping from morning till night, and from the oldest to the youngest all stood on their little hillocks and looked across at us.

Curiosity is not a marked trait of the prairie dog. We wondered at this attention to our side.

One night it came on intensely dark. The wind that for several days had been blowing hard, sank too low to awaken the faintest night-song from the trees, and in this darkness and silence a strange thing was happening.

Next morning we commented on the unusual silence of our over-river neighbors. Not a sound came from them and the town had a deserted air.

The road to our work lay down the bottom.

Scarcely had we gone half a mile before we were in the midst of a dog town—not there the night before!

Everywhere around us rose hillocks; some just started, others of the usual size. Behind these, here and there, little round-headed sentinels peered out of the newly made holes.



Farmers in Twin Falls, Idaho.

What power unerringly guides them to the right place? No scouts have been sent out to look up the new town, and as pedestrians the odds are against prairie dogs.

Some years since I was on the engineering department of the Northern Pacific Railway, and camped near the Greenhorn Bluffs on the Yellowstone. Below us the foothills swung out to the south, making a smooth meadow-like bottom which extended along the river for perhaps a mile.

The stream here was about one thousand feet wide and on its high opposite bank was a large dog town.

The June rise was on. Every day the dark-brown flood hurried its rafts of driftwood or ground unceasingly at the banks. At night with the many sounds of the day stilled we could hear the rounded stones on the river's bottom—the Yellowstone grinding its mid-summer grist.

For days the dogs had been unusually noisy, keeping

There had been an exodus from somewhere, that was plain; and as the town across the river was evidently deserted, little proof was wanting to establish the identity of the newcomers.

This proof was found along the river. The crossing had not been without loss, as was evidenced by many a little stranded form.

As the town was making there was about it a suggestion of divisions, or districts.

It may have been that, like the Israelites of old, each tribe tented by itself, but, as the days went by, and the little engineers advanced their works by gallery and uprise, these lines of demarkation faded and were finally lost to us, although likely enough discernible to the dogs.

I often indulge the fancy that the owl is sent out to look up the new home. I hear the grave and anxious consultations following his report, and see him, like another Moses, leading the way. Why not?

THE WONDERFUL TRANSFORMATION OF SOUTHWEST TEXAS.

BY WM. DOHERTY,

General Passenger Agent St. Louis, Brownsville & Mexico Railway
Corpus Christi, Tex.

(Concluded.)

There is an old slogan which says that "figures do not misrepresent," and in order that there may be no room for questioning the statement that southwest Texas boasts of a climate which for equability, balance, even-temperedness and healthfulness is second to that of no locality within the boundary lines of the United States, the basis of argument shall be the reports of the United States Weather Bureau for the Southwest, covering a period of seventeen years.

During the period the maximum temperature recorded was 98 degrees, while the minimum was 12 degrees. The mean temperature for the entire period is quoted at 70.2 degrees.

In this connection attention should be called to the fact that the minimum just given is by no means a safe criterion for judging the usual temperature for the winter months. The figure quoted was the minimum reading of the thermometer during the unprecedented cold of 1899, which will always be remembered as the most extreme cold spell in the history of Texas. As a matter of fact, it is most unusual for the thermometer to register a temperature lower than 24 degrees, and then for no longer than a brief space of a few hours.

During the month of February, 1905, southwest Texas experienced the severest cold since the memorable spell of 1899. The minimum recorded at Brownsville was only 24 degrees, and onions, cabbage and other truck growing green in the open field, without protection, were in nowise injured. The test was, indeed, a severe one, but it conclusively demonstrated that no fear need be entertained from low temperatures as seriously affecting the production of early vegetables, and placing them on the market weeks in advance of any other section of the United States.

However, it is not the absence of great extremes that speaks so much in favor of southwest Texas as it is the truly wonderful equability of the climate at all seasons of the year. In proof of this assertion the mean monthly temperatures, as deduced from the report of the United States Weather Bureau, covering the period of seventeen years, is reproduced herewith:

January, 55.9; February, 58.1; March, 63.9; April, 70.5; May, 75.8; June, 80.1; July, 81.9; August, 81.9; September, 79.1; October, 72.9; November, 64.1; December, 70.2.

These facts speak for themselves and call for no embellishment. The difference in mean temperatures for the entire year is only 26 degrees! Can this record for equability be approached in any other section of the United States? Winters without severe cold, summers without extreme heat, is the story told by the figures themselves.

Geographical location and topographical conditions have everything to do with climate. In both of these respects Providence has been most considerate of southwest Texas. Two facts contribute largely to the section's magnificent climate. One is geographical location, with respect to the Gulf of Mexico; the other, the unusual elevation, attention to which has already been directed. Because of these two facts, southwest Texas

combines in climate all of the advantages of a coastal country, with its fresh sea breezes, charged with salt air and slight moisture, and the distinctive benefits of inland localities of high altitude, which remove from possibility the existence of swamps, dampness, humidity, miasma and malaria. The atmosphere is warm and dry, possessing the pronounced characteristics of a semi-arid country, but tempered by fresh breezes that pass over the country from the gulf almost every day in the year.

It is extremely doubtful if any other feature of the territory traversed by the St. Louis, Brownsville & Mexico Railway will so greatly contribute to its rapid development as its magnificent, equable, evenly-balanced climate.



A Thousand Oranges on a Single Tree along the line of the St. Louis, Brownsville & Mexico Railway.

Southwest Texas holds the distinguished position of fostering no ailments or diseases which are the result of climatic conditions, and no other section touching the coast of the Gulf of Mexico can claim a similar distinction.

From a standpoint of climate, southwest Texas meets every requirement.

In its classification of annual precipitation deducted from a series of observations covering a quarter of a century, the United States Department of Agriculture places the territory contiguous to the St. Louis, Brownsville & Mexico Railway in the group of localities wherein average annual rainfall varies from twenty to thirty inches. The actual average for a period of

seventeen years is 26.68 inches. Conspicuous as this figure may appear, it should not be taken to serve as a basis for accurate calculation in connection with agricultural pursuits, for the simple yet tangible reason that its distribution is by no means in symmetry and harmony with the demands of crops. In other words, the annual aggregate is made up of few but heavy rains, at uncertain times, instead of lighter rains at certain times compatible with the needs of agriculture.

Southwest Texas is meteorologically classed as semi-arid and the conduct of agricultural pursuits depending upon rainfall for the production and maturity of crops in the section therefore savors largely of the elements of a lottery. The rainfall and the time of its coming are uncertain and the farmer who depends upon rainfall has no guarantee that he will realize the fruits of his toil. This state of affairs, as previously pointed out, until the discovery of artesian water, was the insurmountable obstacle to the development of southwest Texas.

able to control the essential elements to crop production. During recent years the science of agriculture has assumed such a high plane of development that there are but few things today which the careful, exacting and educated tiller of the soil can not accomplish. The scientific farmer of today knows something about biology of plant life and chemistry of the soil in a practical way. With this knowledge, he is able, in a degree, however limited, to control the action of the soil, provided the elements are favorable to his efforts. But it is just at this point that nature, always an uncertain, unreliable quantity, frequently proposes a contrary argument.

While the farmer may be able to control his crop, in a way, by careful methods of culture, he never knows when nature is going to be propitious or contrariwise. Rain may come at the proper moment, or it may not come at all. Even if it does come, it may come at the wrong time and the farmer is never sure of his crop until he beholds the rich harvest in the field ready for



Collection of Citrus Fruits, produced along the line of the St. Louis, Brownsville & Mexico Railway.

In other words, the territory traversed by the St. Louis, Brownsville & Mexico Railway is an irrigation proposition, and nothing certain and positive can be presaged for its magnificent soil and splendid climate when not associated with irrigation. Crops may be raised, in fact are raised, without irrigation in favorable seasons, but the accomplishment of definite results is a matter of chance, pure and simple.

"THE IRRIGATION PROBLEM."

The St. Louis, Brownsville & Mexico Railway deems no apology necessary because irrigation is a prerequisite to the production of crops in the territory traversed by its lines, now in operation. On the contrary, it believes that this requirement is an indorsement and recommendation rather than a hindrance and a detriment, as an analysis and study of the situation will reveal.

The premise will doubtless be admitted that it is a most desirable state of affairs for the farmer to be

the granary; and even then rain may come and destroy his crop before he can safely store it away. In fine, in localities where the agriculturist depends entirely upon natural means of moisture, crop prospects and crop results are always uncertain.

Contrast with this the security of the farmer who depends solely upon irrigation for crop production. With sufficient water for irrigation purposes, he is always sure of a crop. He never has to worry about the coming or the going of the storm clouds. When his crop needs water, he merely turns it on; when it has enough, he simply turns it off. Common sense is the only requisite. He never has to worry about the sunshine to mature and cure his crops, for in a semi-arid country he almost always has it. In other words, because rainfall is practically a minus quantity, and because, on the other hand, he has under his control a bountiful supply of water to do his bidding when and where he will, the farmer who irrigates is surrounded with that halo of security.

RECLAMATION FUND EXHAUSTED.

Engineer Grunsky Tells of Vast Amount of Work Under Way.

Consulting Engineer C. E. Grunsky recently made the following statements to the representative of a San Francisco paper:

"Perhaps the best evidence that the Reclamation Service is doing good work may be found in the fact that the demand for such assistance as can be given by the Secretary of the Interior in the matter of reclaiming lands by irrigation greatly exceeds the reclamation fund now available for this purpose. Including the anticipated revenues of the next few years,

is unused water, but where, either owing to the magnitude of the several projects or the lack of interest on the part of those who have learned to take advantage of easily developed resources, or to other similar causes, the projects could not be given first rank, but have remained secondary to other projects. Many such projects may be carried to completion in the future, when additional funds become available.

"Whenever privately owned lands seek benefit from the provisions of the Reclamation Act, practical unanimity of action by the landowners becomes an essential requisite. This has heretofore been readily secured in those districts where there is a thorough appreciation of the value of irrigation. Nearly \$4,000,000 is being



The Shoshone Falls of the Snake River in Southern Idaho (Looking Down the River)—Part of the Minidoka Project.

this fund, which at present amounts to about \$28,000,000, has been allotted practically to its limit.

"Plans have been made and works are being carried out for the irrigation of about 6,000,000 acres, scattered through thirteen States and three territories.

"These works are not restricted to the reclamation of arid and semi-arid public lands only, but the benefits thereof extend to lands privately owned, subject, however, always to the condition that lands for which water is made available from Government works shall no longer be owned in large tracts, but must be subdivided into farm units of such size as the Secretary of the Interior may direct.

"The investigations by the engineers of the Reclamation Service have been extended into many districts where irrigation would be a great benefit and there

expended in Arizona on Salt River for the benefit of Salt River Valley, where irrigation has long been practiced. Canal owners and land owners have there come to a realization of the importance of harmonious action. The land owners of this valley formed the first water users' association and made the early approval of the Salt River Valley project possible, and the works are now under construction.

In Utah near Spanish Fork, where land is already under cultivation in small irrigated tracts, but where more water is desired, there was not a dissenting voice among the 1,400 interested landowners when the question was presented of increasing the water supply by an expenditure of \$20 per acre. They were all anxious to take advantage of the provisions of the reclamation act and their project has been matured. Water from

Strawberry valley will be intercepted, turned from its course through the mountain in a long tunnel and will be added to their supply, costing them about \$2 per acre per year for ten years.

"Many other such examples could be cited and in no instance is any lack of confidence in the outcome apparent.

"Projects of the magnitude of that of Sacramento valley, where drainage and irrigation might well be united in one great project, can not be undertaken in the near future unless Congress adds to the revolving fund which is now available for irrigation work. A growing demand for federal aid in reclaiming swamp and overflowed lands is manifest no doubt due to the very favor-

In the meantime the hydrographic and topographic sections of the United States Geological Survey will continue under co-operation of the State to collect the data essential as a basis for outlining and planning the irrigation of Sacramento valley lands.

"A feature of the reclamation act which seems to meet with general approval is that which compels a return of the money expended by the land which has been benefited. The funds set aside in the United States treasury for such work are not, therefore, appropriative in the ordinary sense, but are loans expended in useful construction under absolute Federal direction and control. There is not, therefore, anything alarming in the magnitude of projects, for, in the end, the cost



Headwaters of the Snake River, Where It Leaves Jackson's Lake—The Teton Range in the Distance—Shoshone Project in Wyoming.

able opinion throughout the entire West on the merits of the reclamation act.

"When some of the irrigation projects shall have been so far advanced that the repayment of the cost of works begins, the confidence in the provisions of this act will become so firmly established that some of those districts which can not now be improved for lack of funds may be brought within reach at an early date by additions to the reclamation fund from other sources than sales of public lands. The wisdom of increasing the fund is certainly a proper question for the consideration of Congress. In the meantime the projects of the future are not being overlooked by the reclamation service. When local and general benefit is so manifest as in the case of a Sacramento valley project early authorization is desirable to undertake the project.

thereof to the United States will only be the interest on the money thus invested.

"It is also to be emphasized that Government aid in matters of land reclamation is not for the benefit of the land speculator or speculating farmer, but is intended to aid in the building of homes.

"Home building on the small irrigated farm is the central idea which justified the enactment of the reclamation law."

THE LAND OF THE CONCHOS. "Land of Promise."

BY W. J. B. MOOR, SAN ANGELO, TEXAS.

The land of the Conchos, not so called from any tribe or people who may have once inhabited it, but

from the several clear, sparkling rivers flowing through it and bountifully watering it, as well as affording a retreat for the health seeker, or man of leisure, to while away the time with hook and line, angling for the finny tribe, which are abundant in all these streams and that of the gamiest sorts, among which are trout, black bass, white, black, sun and goggle-eyed perch as well as cats, blue, yellow, channel and mud cats, so that one may be entertained though solitary and alone, along the banks of these beautiful streams under the broad spreading branches of the immense pecan trees that fringe the banks of all the clear rippling streams of this western Texas country, for that is where this land of promise is.

These rivers likely take their names from the many shells found in them, which sometimes yield pearls, some very valuable.

But as the things above do not always appeal to those who think of more material things, we have but to mention the use to which these streams are being put, which until recently only furnished water to the immense herds of cattle, horses and sheep held on these rich pasture lands by the lordly stockman, who formerly held the country and to whom it has not only been the land of promise, but of fulfillment, for many have waxed rich from the "fat of the land" in stock; but the ever-increasing demand of the agriculturist has called and is calling for this land, as it will for all other rich lands where improved methods and modern machinery may be used to advantage. So, in the three or four years since farming began in this country, it has forged rapidly ahead, and each year new and larger areas are responding with bountiful crops to the magic touch of the intelligent farmer.

The lands for the most part are of a rich, red loam, though in some places nearly black, as especially on the divide lands (spurs of the great plains), sometimes twelve to eighteen miles wide, all easily cultivated and produce fine crops of small grain, milo maize, Kaffir corn, sorghum, millet, etc., as well as cotton without irrigation and with irrigation (from streams or wells) anything that grows in a semi-tropical or temperate zone, including alfalfa and all kinds of vegetables and fruits, except the strictly tropical.

And so quite a number of pumping plants are being put in this year. These generally have a dam as part of the plan. Formerly the dams were built high enough to flow the water out through ditches.

Still the acreage of dry land farms is much the greatest, for to the south and east of this place, San Angelo, Tom Green county, Texas, there is a body of slightly rolling rich prairie land twelve to eighteen miles wide and about fifty miles long, apparently a sunken plain, with mountains showing both to the north and south.

This body of land is called Lipan Flats from the tribe of Indians inhabiting this country until the early seventies.

These lands are easy to put in cultivation and easy to care for, one man with teams and cultivators cultivating as much as one hundred to one hundred and fifty acres, except the one necessary hoeing of cotton, for which and the picking he must hire help. Other crops are gathered with machinery.

People from all sections of our country are learning of the health-giving ozone of this country, judging from the increasing cosmopolitan population and the many new houses building (about one thousand in last two years), for people coming for health alone, and yet

many live the year around in tents or shingle roofed houses with canvas walls and indeed this seems best for those affected with pulmonary or tubercular troubles, for which this climate seems especially beneficial, the elevation being just enough with the dry atmosphere to give the desired results and at the same time not so great as to seriously affect those who also suffer from heart troubles. The elevation at this point is nearly two thousand feet; on some of the mountains and divide plateaus twenty-seven hundred to three thousand feet.

One camp near here conducted by Dr. Watts, from New York State, as a sanitarium, has all the houses provided with canvas walls with ingenious arrangements of windows and walls to provide fresh air and light and also avoid draught.

Prominent Catholic sisters of Galveston, Texas, are also interesting themselves in the idea of building a large sanitarium here.

The Gulf, Colorado & Santa Fe Railroad has for a long time been the "pathfinder" to this wonderful country, this being the present western terminus of their branch line from Temple, Texas, but soon they hope to hear the rattle and puff of Arthur Stillwell's new transcontinental line, now building from Kansas City to Topobolampo, Mexico, the Kansas City, Mexico & Orient Railway, and yet other projects for railroads for this "promised land" are on foot, as well as the hope and prospect that the Gulf, Colorado & Santa Fe will extend to make a connection with the Santa Fe system in New Mexico.

In fact a large party of the officials with their wives and others were here recently on a trip of inspection and they met with a royal welcome at this their second largest shipping station (Galveston, of course, being their largest).

Among the party were Mr. A. G. Kendrick, second vice-president of the Atchison, Topeka & Santa Fe; Mr. W. C. Nixon, vice-president and general manager of the Gulf, Colorado & Santa Fe, and Mr. Pettibone, general superintendent, and others.

If your readers care to hear more of this wonderful country there is much more to tell.

Lands are yet cheap and opportunities are plentiful. A good plan is to "come and see."

TIMBER AND STONE ACT.

John McAlpine, of Duluth, Presents His Opinion to Committee on Public Lands.

During a recent visit of Mr. John McAlpine, of Duluth, Minn., at Washington, he was asked for his opinion on the matter of repeal of the timber and stone act. He put his views in the form of a brief, and it was presented to the Committee on Public Lands in the form quoted below:

"The parties who have been opposed to the present land laws for several years, are opposed for their own special benefit and gain, not for the benefit of the people at large or the welfare of the country.

"Among the several statutes disposing of public lands the Timber and Stone Act stands in a class by itself. When the disposal of the public domain was first considered by the Government, it was found that there were vast tracts of territory that were unfit for cultivation, and how could those lands be disposed of so as to contribute in the largest degree to the welfare of the greatest number? That was the question that

confronted Congress when it enacted what is known as the Timber and Stone law.

"It should always be borne in mind that the Government does not own its lands as a private individual owns his. It does not hold the public domain as a private proprietor holds his. It holds all the public domain for the common good, to be disposed of for large and public ends. It does not dispose of lands simply to get money. The object of the Federal Government in disposing of the public domain has never been to simply get the price of the land, but it has been chiefly concerned in the disposal of the lands to see to it that they shall be made to contribute in the largest measure to the common good of the citizens at large.

"Congress decided that the best way to do that was simply to throw them open to purchase so that they might be acquired by private owners at a price which would enable such private owners to buy 160 acres and no more, for each citizen of the United States to use said land for his own special use and benefit by paying to the Government \$2.50 per acre, thus making the lands in the different towns, counties and States taxable, the revenue received from same to be used for building highways and roads, to provide schools, courthouses, etc. If these tracts are put into forest reserves or kept out of the market, from the public, it decreases the taxes from those counties, towns and States and stops the general progress of the country.

"There are now about 93,000,000 acres of the public domain which have been set aside for forest reserve purposes, there being no taxes received on any of this large tract of the public domain. Ninety-three million acres or more have been permanently taken out of the market, which stops the progress of the country, stops the building of roads and schools, as the same can not be taxed for any purpose. The towns, counties and States and the middle classes of people suffer the loss of the revenue which should be received from those lands. It is not the Federal Government that is the loser.

"Take our present land laws since they were first put on the statute books and follow them up. The pioneer is enabled to push forward, take up the public domain, as the laws allow him to do, by homestead, by timber cutting or timber and stone. As soon as land is taken up and patent issued it becomes taxable and a benefit to the counties and towns which the same may be in. Be it prairie country, desert country, or timber, the people have prospered. If the pioneer sells this land he receives a benefit. He may sell it, or some of his family having grown up may be desirous of taking up the small portion allowed under the existing laws, 160 or 320 acres.

"The public domain belongs to the people and the officers of the Government are merely holding the same in trust for the people as custodians. If we boast of a free country, let it be free. Don't let it be controlled by monopolies and combinations which are striving to control the public domain in some manner for their own selfish use and benefit and against the welfare of the people and the progress of the country. I can safely say there is 90 per cent of the business men of the country deceived by the combination which is striving to control the public domain. It is one of the best organized, most far reaching and smoothest working combinations which has ever existed in this country and the most dangerous since our Civil War. They are

organized from the Atlantic to the Pacific and know what happens from one end of the continent to the other in a few hours' time. This combination has been working for the past five or six years to control all the public domain. It cares little by what method it can accomplish its ends as long as it can take all of the public domain out of the market.

"The men who are talking about the monopoly and land grabbing are the very men who are the land grabbers. It is not the Timber and Stone Act that has taken up the public domain to such a great extent. For the last five years the lands were taken up by first setting aside forest reserves.

"The people who advocated the same were the people who received millions upon millions of acres of scrip from the Government inside of the said forest reserves. I know of over 200,000 acres of land taken up in one day in the State of Idaho by the same people that are flooding the country with literature and printed matter crying out against the land grabbers. They are the land grabbers themselves. That is the way they take to further their own interests and deceive the public and business men of the country.

"As I have stated 90 per cent of our honest, intelligent business men are deceived by the deep laid plans of this combination. It takes some study to uncover the main object of those who are trying to control the public domain. Who pays for the literature mailed broadcast over the United States, to every newspaper, to every banker, to every business man of note?

"It is not true as published that there are millions of acres taken up under the timber and stone act by the large land owners. The large land owners are not in favor of the timber and stone law because they can not control the same. It is our best citizens, college graduates, school teachers, farmers, clergymen of all denominations and others that take up 160 acres under the timber and stone act, who pay the Government \$2.50 an acre and use the same for their own special benefit.

"There are now about \$30,000,000 received from the sale of the public lands which has been set aside for the benefit of irrigation under the Reclamation Act, to be used for irrigating purposes to help to open up the arid and semi-arid lands. This sum is increased every year largely from the sale of the public domain under the timber and stone and the commuted homestead law. It would be a dangerous move to stop the revenue of the present fund for irrigation by repealing the timber and stone law. The irrigation is a new movement which requires close attention from Congress in the matter of expending the moneys received from the sale of our public lands.

"The day may come, should the public domain be taken out of the market, that the business men of the country will have their eyes opened to the workings of this combination. Then it may be too late to remedy matters.

"All I would say to the average business men is, study the proposition. Look into the millions of dollars which the combines have received from the sale of scrip during the last five or six years. They are now receiving from \$8.00 to \$10.00 per acre for this. The issuing of scrip is not repealing the law as it was supposed to be by the last Congress. Any man can get all the scrip he wants today if he has the money to pay for it. Look carefully into this matter before you repeal any of our present land laws."

THE ARKANSAS VALLEY.

BY D. V. BURRELL.

The irrigated section of the Arkansas Valley tributary to Rocky Ford, Colo., was once a part of the great Colorado Desert. The native grasses are Buffalo and Gramma grass on the sandy loam soil and a species of Bunch grass on the heavy low soil. Nearly all the soil is a sandy loam.

We depend entirely upon irrigation to produce our crops. Sugar beets are the main product, of which we now grow to supply four large sugar factories and several more factories are to be built this and next year. Alfalfa is also very extensively grown. It produces an average of three crops a season and in all yields four to five tons per acre.

The Rocky Ford cantaloupe has done most to make Rocky Ford known throughout the United States.

The production of this melon for eastern market in car lots began ten years ago and has now reached the extent of 800 to 1,190 cars annually. The largest output for one year, 1,190 cars, amounted to about twenty million melons.

I plow as early in the spring as the land can be worked, using a reversible plow which throws the land all one way thus avoiding back furrows and dead furrows. As soon as a strip as wide as the harrow is plowed it is harrowed thoroughly, first with the teeth straight to stir deep as possible, then with the teeth slant to crush small lumps and leave a fine well settled seed bed.

The land is then cross marked in rows six feet apart and furrows run with the slope of the land six feet apart, using an 8-inch single shovel plow.

The seeds are then planted on the border of the furrows in hills ten to twelve inches long, ten to twelve seeds to the hill. If the furrows run north and south, plant on the east side of the furrow; if east and west on the north side of the furrow. This allows the sun to warm the soil near the hill to best advantage.

A small stream of water is then turned into each furrow and allowed to run until the surface of the soil shows the moisture two or three inches back of the hills.

After three days the surface of the hills is raked carefully with a garden rake, taking care not to disturb the seed. As soon as the plants are well up they are carefully hoed and loose soil drawn well up to the lower side of the leaves. Any missing hills are replanted. They are again irrigated the same as before. Then as soon as the ground is dry enough, which is usually about three days, the furrows are cultivated in and the melons thoroughly cultivated both ways, shallow close to the hills, but deep away from the hills. The cultivator is immediately followed by a harrow to level and leave a loose mulch on the surface. The hills are again hoed as before and again if any are missing they are replanted.

Furrows are again run as near the hills as possible and not cover the leaves. They are again irrigated and the furrows plowed in and cultivating continued until the vines have grown so long that it is necessary to run the last furrows which are to be left through which to irrigate the crop until harvested. They are usually irrigated about every two weeks.

Through our growing season the days are very warm and the nights cool, the temperature varying about thirty to forty degrees. This condition causes the plant

to become accustomed to extremes of heat and cold and produces the highest possible state of development.

A sandy loam, sunshine every day, cool nights, water to be applied when needed and kept away when not needed and climatic conditions permitting cultivation to be done at the right time are the advantages which make this the ideal melon growing section.

The production of Rocky Ford cantaloupes throughout the United States in 1905 amounted to 6,920 car loads, practically all of which were from seed grown at Rocky Ford.

A FARMER'S IRRIGATION.

There is at least one man in the rain belt region of the United States who has solved the drouth problem, and in overcoming his drouth nightmare he has somewhat unexpectedly discovered that every year brings a drouth, to a greater or less extent. "I have put in, as you see," he said to me, "a simple plan of irrigating some of my land from a little stream running through the place which I thought would give me crop insurance during dry years; but it has taught me that never a year goes by that there is not some period or periods of greater or less extent that a watering does not greatly increase the crop. I can observe accurately, because I have my irrigated crops growing practically alongside those which get only rainfall for their watering."

This farmer's discovery of the efficiency and ease of irrigating was in a measure accidental. A little stream which showed a capacity—in July—of about six cubic feet per second, or say, 2,500 gallons a minute, which is a much smaller stream than the figures would indicate to the unwary, runs with a slight fall through a piece of rich bottom land and at one point near its lower end had been dammed by the boys to form a bathing pool. Several years ago, while in the midst of a destructive drouth which was burning up the crops even on this usually moist bottom land, the farmer raised this dam by throwing in earth with the help of a plow and scoops, and crudely flooded several acres of cabbages, melons and some recently planted late corn. The result was so satisfactory and the idea of overcoming nature so fascinating, that the next year, after the spring high water season, a more substantial dam was put in at the head of the field which enabled the flooding of the entire bottom, with a little rough surveying to find the levels. The yield is stated to have been enormous, and while the farmer's tendency has been to over-irrigate, he is learning more than he ever knew before about the great productive capacity of land which has enough water at the right time, and also the great response which comes from heavily manured soil when well supplied with water. His dam is a cheap affair, built entirely by labor on the farm, and largely reconstructed each year. It has no storage capacity, the irrigation depending entirely upon the regular flow.—*The Furrow*.

\$2.50 will secure for you one year's subscription to THE IRRIGATION AGE and a finely bound volume of the Primer of Irrigation which will be sent postpaid in a few months, when volume is completed. The Primer of Irrigation will be finely illustrated and will contain about 300 pages. Send post office or express money order for \$2.50 and secure copy of first edition.

"THERE'S A REASON."

(From the Boston Commercial.)

IRRIGATION GRAFT.

Certain parties in New York and Washington are spending thousands of dollars per month in distributing four-page supplements to newspapers generally throughout the country. These supplements are delivered, expressage prepaid, in the offices of the publications, without any charge whatsoever. They are absolutely free to any publisher.

Tons of paper are being printed every week, and large amounts are being paid the express companies for carrying and delivering these supplements, even as far as Texas and Utah.

Publishers have wondered from month to month what was the cause of such unprecedented liberality, nothing of the kind ever having been experienced before except during political campaigns, when the national committees supplied and delivered supplements without money and without price.

"The darkey in the wood pile" is now making his appearance in the matter inserted in these supplements. It turns out that irrigation of some arid lands in the far West, for the benefit of a few individuals, the cost of irrigating which is to be paid for by the United States government, is the object of the supplements.

Publishers to whom they are given are expected to issue them with their regular publications in order that public sentiment may be worked up in favor of obtaining from the government expenditures of millions upon millions of dollars, so that these almost worthless lands may be increased in value and sold at enormous profit for those interested.

The newspapers are to be made the cat paw for this purpose. The promoters of the scheme can well afford to spend several hundred thousands of dollars, largely contributed by a few railroad companies and interested individuals, for by so doing the United States treasury may be tapped for millions and the people of the East, South and middle West taxed in order that the owners of this arid land may be benefited.

It can undoubtedly be furnished as cheaply and probably at a much less price than gasoline. It can no doubt be distilled widely, and will meet with a very large demand throughout the country for running internal combustion engines for pumping or any other purpose requiring power, and it will also be used for lighting and heating the home in the city or on the farm very extensively.

It comes from that which the farmer produces and undoubtedly the proposed new law will result in much benefit to the agricultural classes in the way of creating an increased demand for potatoes, sugar beets, corn and other products of value in the distillation of alcohol.

The proposed bill provides for the denaturizing of the alcohol, rendering it unfit for use as a beverage, and it is intended that this denaturizing shall occur at the time it is withdrawn from the bonded warehouse, so that it would not seem that any undesirable results in the way of an increase in intemperance would follow the enactment of such a bill as proposed.

At least two bills providing for the enactment of such a law have been introduced in Congress and the Ways and Means Committee has already held a hearing, and it seems to the writer that the proposed legislation should receive every possible encouragement from the agriculturists and all their good friends throughout the land.

Germany has for some time had free alcohol for manufacturing and other uses and for many years now has practically led the world in some lines of manufacturing on this account, and solely on this account. France, England, and we might say all of the leading European countries also have similar laws and it would seem that the United States, where such a law would perhaps be of even greater benefit than would be possible in the European countries, should certainly give the matter the most careful and considerate attention, and give the people tax free alcohol for such purposes as we have mentioned.

As I have not seen anything in your publication relative to this subject, I thought perhaps you would be pleased to have something along this line and if you wish to use this matter you are at liberty to do so. Yours truly,

DEMPSTER MILL MFG. COMPANY,
R. H. YALE, Secretary.

CAMBRIDGE, ILL., February 3, 1906.

IRRIGATION AGE, Chicago, Ill.

Dear Sirs—In the February issue of THE IRRIGATION AGE Mr. H. J. Myers desires information in regard to drainage. I have had a little experience along that line of work, especially problems of the same description as confront Mr. Myers.

His proposition to drain his land by the use of wells and then running his tile into them is a plan that has worked to good advantage in some localities. The topography of the country controls its success or failure. Where this method has been practical the country is a tableland, that is, it lies at some elevation above the bed of nearby streams or rivers.

The method employed is to drill through the rock that underlies the locality until they strike water, then case the drill hole from the rock up with steel or iron casing; this casing keeps out surface water and the well is thus not affected by water above the rock. Where they use wells to drain into the water stands at from 75 to 100 feet below the surface.

There is another method employed in such cases as Mr. Myers has to deal with, and the one I prefer. It is to build a cistern some ten feet deep and ten feet or more in diameter and run your tile into it. Then by the use of a windmill, gasoline or steam engine, pump the water from the cistern over a dike thrown up to prevent the water from flowing back on the land.

In this county quite a number of such plants are in successful operation and the windmill is to be preferred where the area of land is not too large, as the cost of operation is next to nothing.

In the laying of the tile see that they are laid to grade, and the grades established by a drainage engineer or surveyor. This is the secret of successful tile drainage.

I own and operate a farm and these drainage problems came up to me. I solved them by studying to become a drainage engineer so as to do the work in an intelligent manner.

If this will be of any benefit to Mr. Myers he has my consent to make use of it and I wish him success with the undertaking.

Yours respectfully,
ABRAM A. FUNK.

CORRESPONDENCE

KIMBERLY, CASSIA CO., IDAHO, March 19, 1906.

EDITOR IRRIGATION AGE, Chicago.

Dear Sir—Can you give me the address of some one where I can get cuttings of the Oiser Willow, the one you mentioned in Primer of Irrigation? Hoping to hear from you soon,

Yours truly,

G. W. OSTERHOUSE.

Will some of our readers kindly furnish Mr. Osterhouse with the desired information?

BEATRICE, NEB, March 7, 1906.

THE IRRIGATION AGE, 112 Dearborn St., Chicago, Ill.

Gentlemen—A subject which is now receiving much attention from a large number of people is one of very great importance to farmers who must pump their water for irrigation. This is the proposed withdrawal of the internal revenue tax on alcohol used for manufacturing, industrial and agricultural purposes. It undoubtedly would not occur to the majority of people who are not familiar with the subject just how this would benefit the irrigator, as it is not generally understood that alcohol is an excellent source of power when used in internal combustion engines. A gallon of alcohol will produce as much power used in an internal combustion engine as a gallon of gasoline and is in every way as satisfactory. If the internal revenue tax is taken from alcohol

CAMBRIDGE, ILL., March 6, 1906.

IRRIGATION AGE, Chicago, Ill.

Dear Sirs—I will endeavor to answer the inclosed letter and give the information he desires. If you are satisfied with the answer to this communication and the letter I have taken the privilege of writing in answer to Mr. H. J. Myers' letter in the February issue you may address similar communications to me and I will endeavor to reply to the best of my knowledge.

I will now answer as best I can the letter of Mr. J. T. Richmond. In regard to the cost and general information on ditching I think I can give a fair idea of the cost in the States of Illinois, Iowa and Missouri.

I will give the cost of ditching by hand excavation, as this is the principal and about the only method used for making ditches of similar dimensions to the one he mentions. The cost is approximately as follows: For ditches from 24 inches to 42 inches in depth and from 12 inches to 20 inches in width the price ranges from 18 cents to 26 cents per rod; this includes the laying of the tile and sufficient covering of earth to hold tile in place. Then for each additional foot or fraction of foot depth of dig 10 cents per rod is added.

The ditch of dimensions mentioned by Mr. Richmond would cost about 20 cents per rod.

If excavating is done by the cubic yard the prices range from 8 cents to sometimes as high as 25 cents.

Should the digging be in gumbo, gravel, or hardpan, the cost would be proportionately increased. These prices give to the laborer from \$2.00 to \$4.00 per day.

About 75 per cent of the tile, sewer, and other small ditches could be excavated with a successful ditching machine and then grade the ditch and lay the tile by hand at a very small cost. The other 25 per cent of the work is in ground that is too soft and wet to carry the weight of the horses and machine.

According to Mr. Richmond's statement the excavating of a ditch with his four-horse rig, allowing \$3.00 per day of ten hours for each man and team and \$1.50 for the wear and tear on machine the cost will be about two cents per cubic yard or less than five cents per rod for a ditch thirty inches deep and eighteen inches wide. Then add about four cents per rod for grading and laying tile and you will have the approximate cost with Mr. Richmond's machine. This is something that will bear investigating by any one contemplating ditching that can be done with his machine.

Yours respectfully,

ABRAM A. FUNK.

GREAT FALLS, MONT., March 3, 1906.

THE IRRIGATION AGE, 112 Dearborn St., Chicago, Ill.

Dear Sir—Replying to your communication from Rev. D. Graef, of Newport, Ill., making inquiry as to land offered by Charles T. Kleese, of this city, in Teton County, just north of here, I can say that the land, so far as I know, is all right; better, in fact, than any land your inquirer would find in the entire State of Illinois.

The particular tract to which reference is made comprises about 8,000 acres, and the first water right out of Teton River of 3,000 inches goes with it. As I remember, about fifty inches goes with each quarter section, or 160 acres of land.

The land is level and capable of the very highest cultivation. It will raise fifty bushels of wheat to the acre without any trouble whatever, and there is no such thing necessary as rehabilitation of the soil through any artificial process.

Without any interest in the matter whatever, I should certainly say that, for anyone who desires to farm, and by that I mean real farmers, the price of \$15 an acre is extremely reasonable, as it will be many times that in this section before very long. At the present time the better quality of land at Billings, about 200 miles south of here, is selling at \$100 an acre, which five years ago was selling for \$10.

If the parties mean business the land is all right.

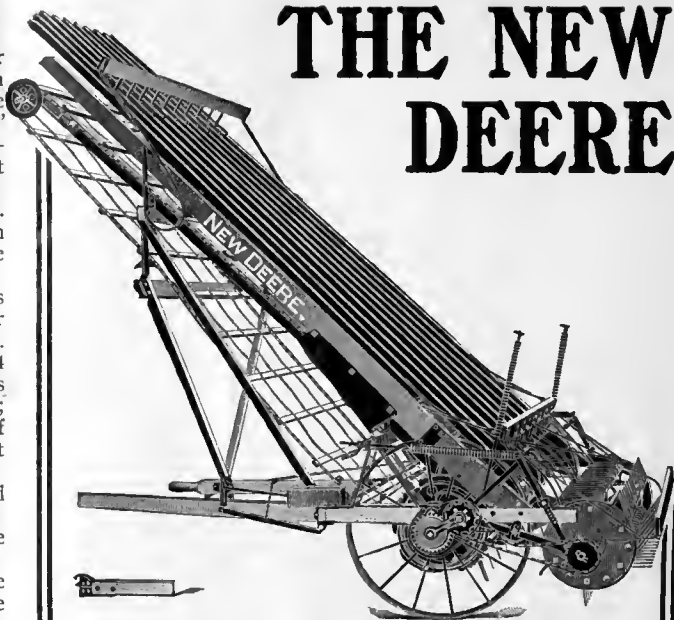
Yours very truly,

E. A. LORNEY.

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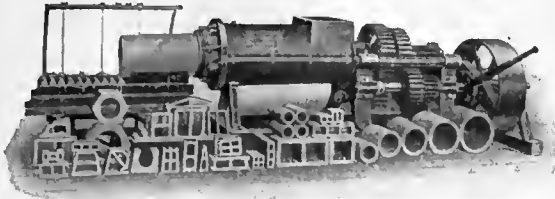
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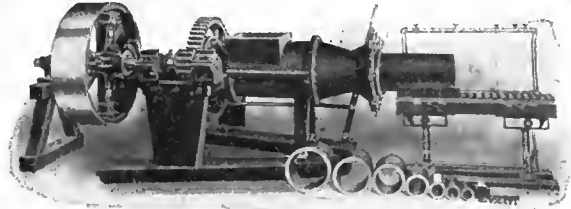
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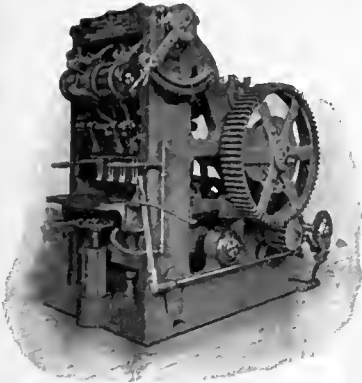
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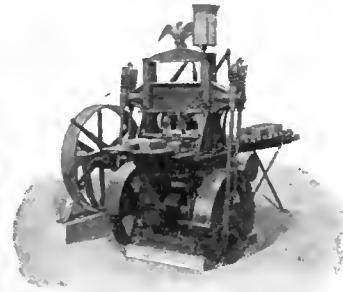
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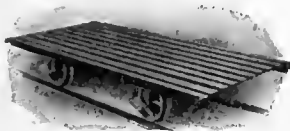
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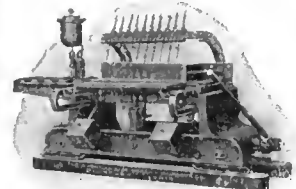
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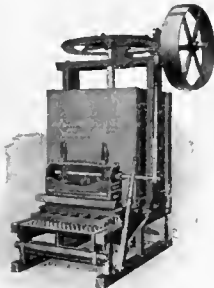
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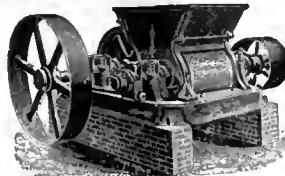
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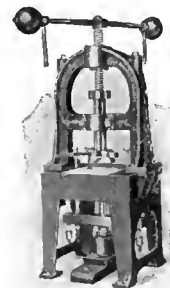
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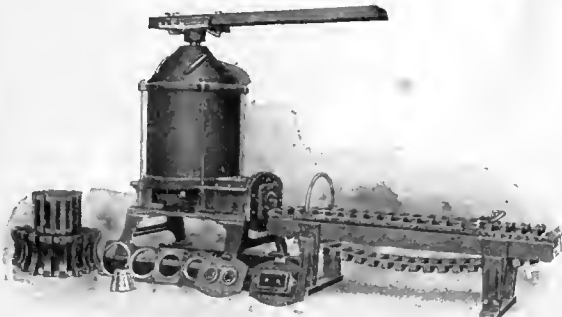
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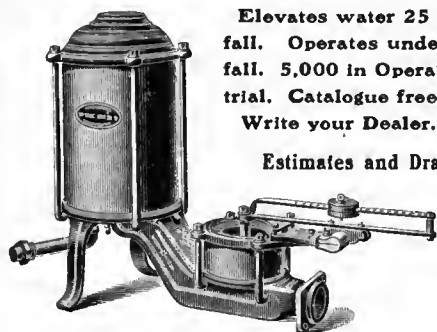
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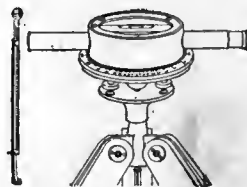
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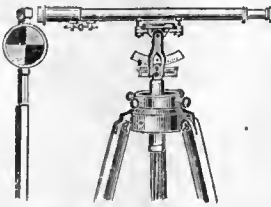
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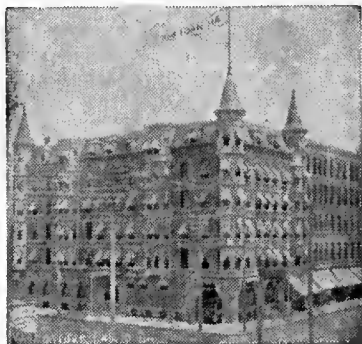
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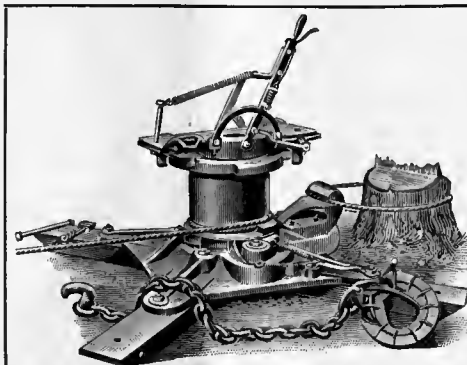
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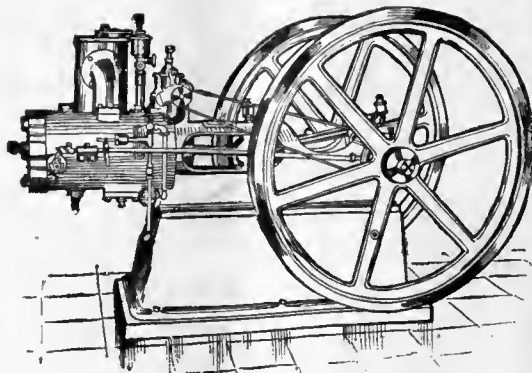
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2 to 25
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For any duty



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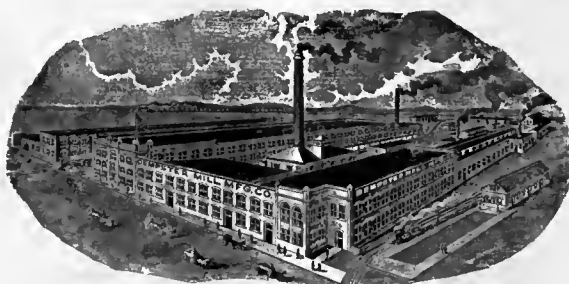
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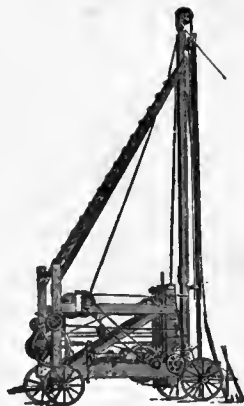


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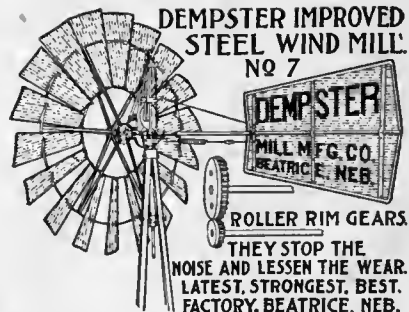
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1906

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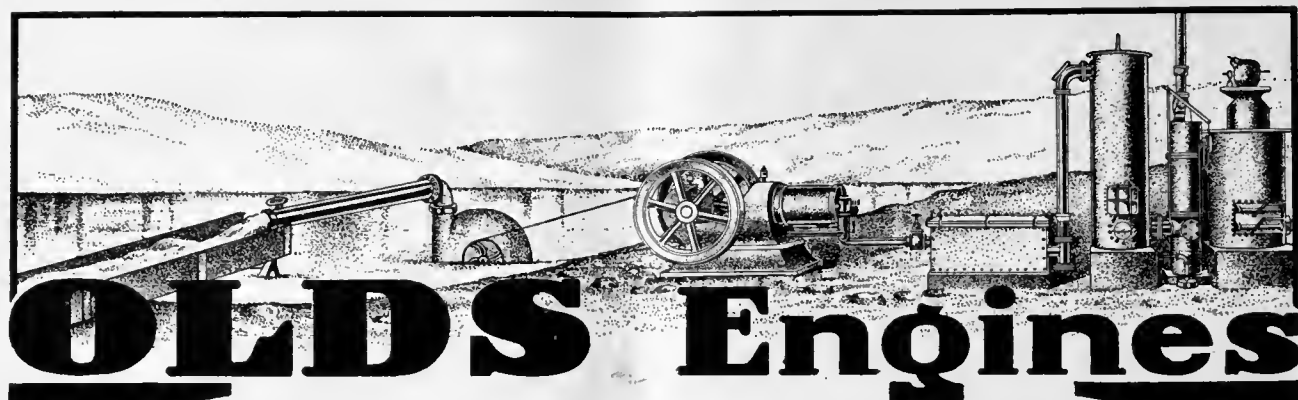
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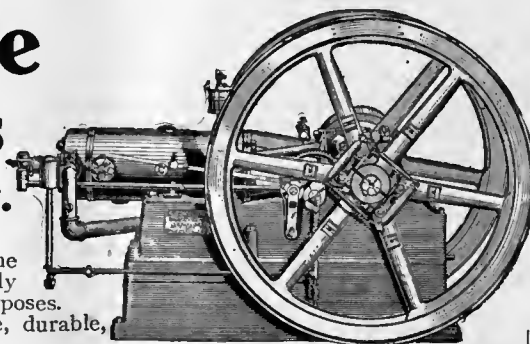
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With maximum power, they can be operated at a minimum expense.

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They can be attached to any kind of pump in any position, for raising water from deep or shallow wells, reservoirs, canals or running streams.

They excel in **full, regular and long sustained power.**

They can also be used for a general purpose engine for sawing wood,

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They are unequalled for power of all kinds.

Made in variety of sizes and styles:

Vertical—2, 3, 5 Horse Power.

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An engine of this description, with a suitable pump, makes agriculture a success where it would otherwise be impossible.

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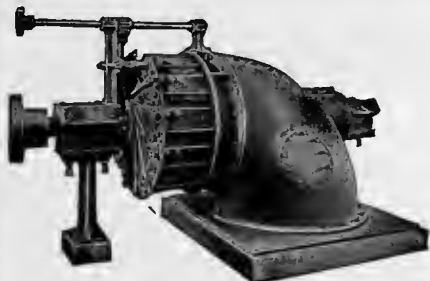
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When the PUMP cannot be direct connected to the turbine shaft, the power is usually transmitted by gears, shafting, etc. On account of the HIGH SPEED of the SAMSON, for a given power, lighter and consequently CHEAPER transmission machinery can be used.

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Uncle Sam Satisfied

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Surely a powerful endorsement of "Otto" quality.

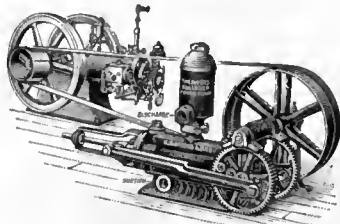


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STANDARD OF THE WORLD

MYERS POWER PUMPS

WITHOUT AN EQUAL ON THE GLOBE



OPERATING
WITH
GAS ENGINE

FIG. 952

HORIZONTAL BULLDOZERS, 3' to 6' CYLINDERS

MYERS
BACK GEARED
WORKING HEAD

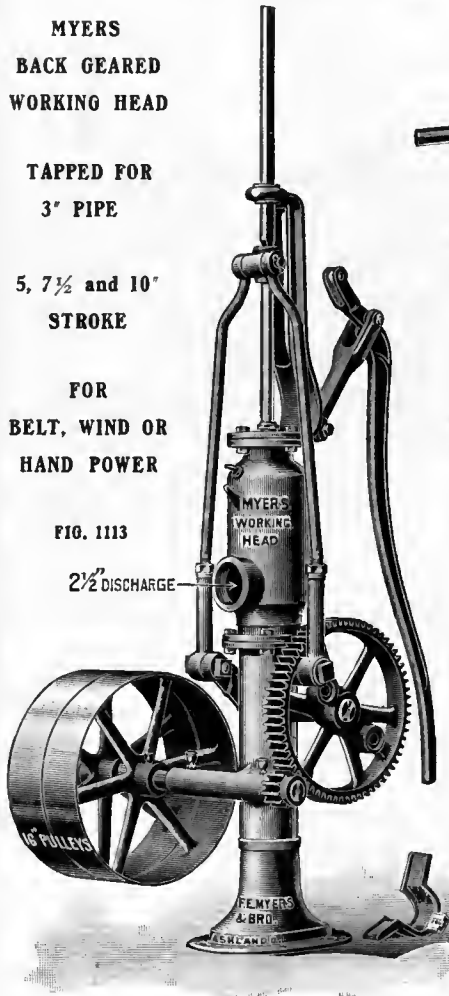
TAPPED FOR
3" PIPE

5, 7½ and 10"
STROKE

FOR
BELT, WIND OR
HAND POWER

FIG. 1113

2½" DISCHARGE

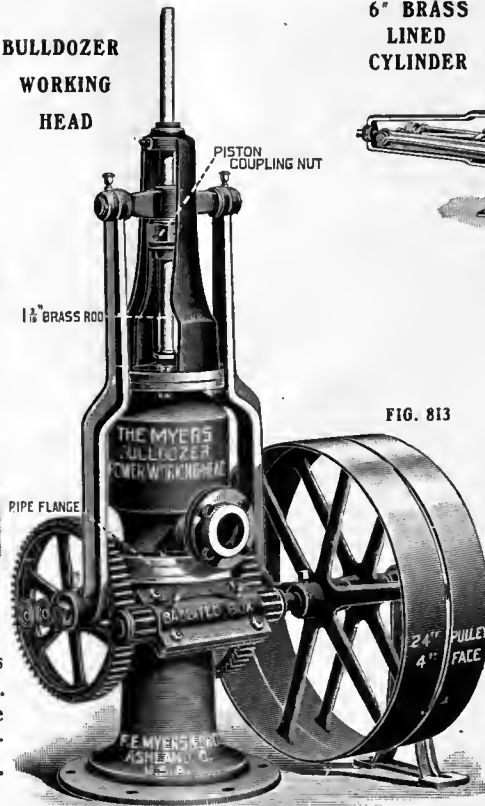


BULLDOZER
WORKING
HEAD

PISTON COUPLING NUT

1½" BRASS ROD

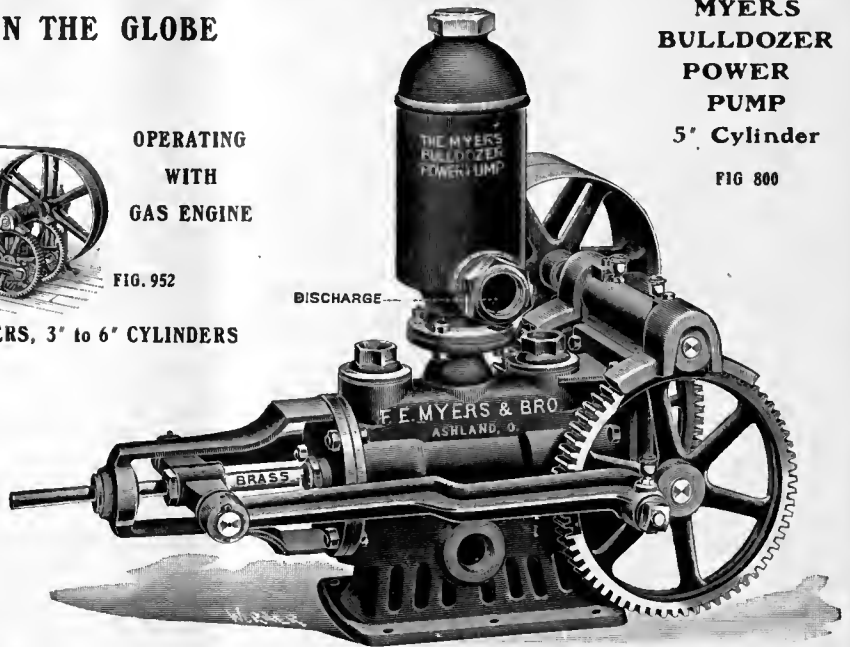
PIPE FLANGE



MYERS
BULLDOZER
POWER
PUMP

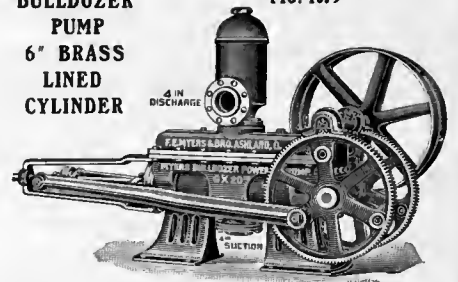
5' Cylinder

FIG. 800



BULLDOZER
PUMP
6" BRASS
LINED
CYLINDER

FIG. 1079



MYERS BULLDOZER
WORKING HEADS

No. 359

5", 7½", 10" STROKE
DISCHARGE, 2½ or 3 INCHES
SUCTION 2 to 4 INCHES

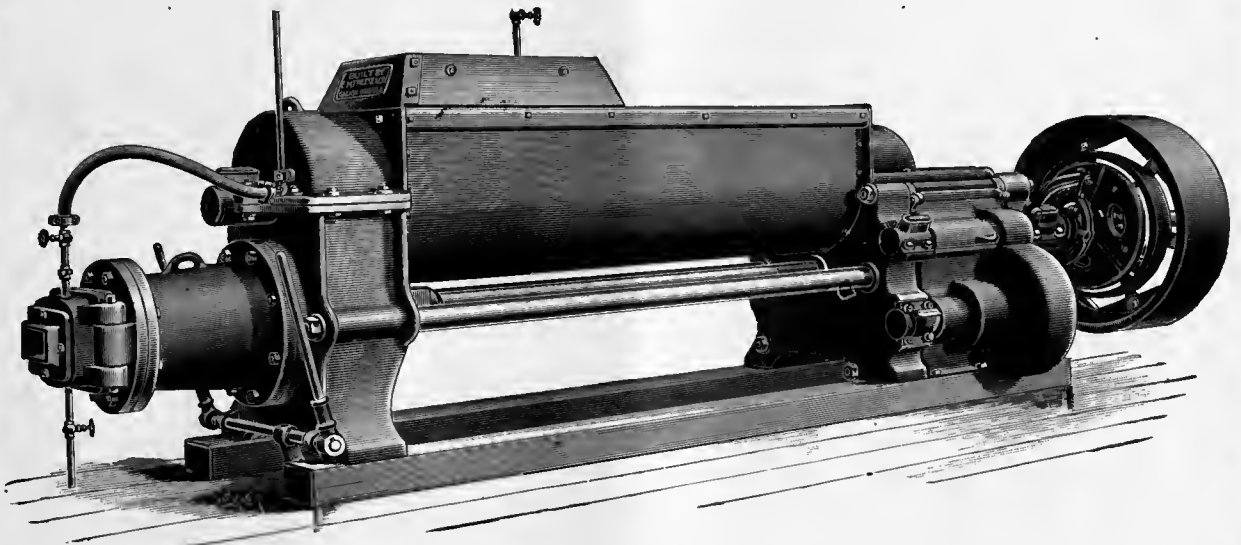
No. 364

12", 16", 20" STROKE
REGULARLY FITTED 4" DIS-
CHARGE
SUCTION 8' OR LESS

Write for Descriptive Circulars and Prices
We want you to acknowledge this Ad. so.
that we can acquaint you in detail with the
superior features of Myers Power
Pumps. This is the proper season.
The right time to write is right now.

F. E. MYERS & BRO., ASHLAND OHIO, U.S.A.
PROPRIETORS OF
ASHLAND PUMP AND HAY TOOL WORKS

UNION MACHINES WITH PUG MILLS COMBINED



FIVE SIZES ALL CAPACITIES

Outfits for Drain Tile, Hollow Ware, Building
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If interested write us for particulars and estimates.

E. M. FREESE & CO.
GALION, OHIO

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You have heard of the cow that gives a big pail of milk and then at the last moment kicks over the bucket and spoils it all?
What about the man who grows a good crop of grain and then half harvests it?
You wouldn't waste half your crop.

Of course not.

But why waste any of it?

Why not get it all?

As the boys say, "Every little bit helps."

Every little bit **wasted, counts—and counts against** you and your profits.

As a sensible farmer, you can't afford to approach harvest time without making sure that you are ready for it the very minute that your grain is ready.

You can not afford to depend upon a harvesting machine that wastes even a small part of your grain.

You can not afford to spend your money for a "may-be-so" harvesting machine—one that may or may not do your work for you in a satisfactory manner.

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You can not afford to start harvesting with a machine that will half kill your horses before your grain is cut.

You can not afford to start harvesting with a machine that is likely to cause delay in your work.

You can not afford to take chances.

You want to be sure, and now is the time to make sure.

Go to the Nearest Dealer

Examine for yourself the line of standard harvesting and haying machines for 1906. Get a catalogue and study their construction. You will find in

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THE IRRIGATION AGE

VOL. XXI

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No. 7

THE IRRIGATION AGE

With which is Merged

MODERN IRRIGATION

THE IRRIGATION ERA

ARID AMERICA

THE DRAINAGE JOURNAL

MID-WEST

THE FARM HERALD

THE D. H. ANDERSON PUBLISHING CO.,

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ANNOUNCEMENT.

"The Primer of Irrigation" is now ready for delivery. Price, \$2.00. If ordered in connection with subscription, the price is \$1.50.

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Interesting to Advertisers.

It may interest advertisers to know that *The Irrigation Age* is the only publication in the world having an actual paid in advance circulation among individual irrigators and large irrigation corporations. It is read regularly by all interested in this subject and has readers in all parts of the world. *The Irrigation Age* is 21 years old and is the pioneer publication of its class in the world.

We have at hand Agricultural Bulletin Union Pacific No. 56, issued by the General Passenger Literature. Department of the Union Pacific Railway, Omaha. The Bulletin treats of the principal crop yields and covers seventeen states and territories west of the Mississippi river, six of which are in the territory of the Southern Pacific and eleven on the Union Pacific and its auxiliaries. These eleven states, only a few years ago, were comparatively an unproductive wilderness. Now they are the major portion of the granary of the world.

The total acreage, yield and farm values of these eleven states for the past year almost reach one thousand million dollars in value.

This valuable bulletin will prove interesting to all who may be interested in the development of the West. Write to the General Passenger Department, Union Pacific Railway, Omaha, Neb., for a copy.

The recent overwhelming disaster which visited the Pacific coast has given a fair idea of the mettle of men of affairs, and this has been no more strikingly exhibited than in the case of Mr. E. H. Harriman, president of the Southern Pacific system. When the first news of the appalling disaster reached that gentleman he got in communication with the next man in power, Mr. J. C. Stubbs, of Chicago, and the two were on their way to the stricken district within a few hours and have remained steadily in the danger zone, doing everything

in their power to assist those in distress and bring order out of chaos. To the individual who has not been in touch with similar conditions this may appear to be a simple matter, but the writer, who was in contact with the situation during the first three days of the trouble, is in a position to testify that the conduct of these gentlemen, as well as other railway men, was heroic in the extreme.

One had but to stand at a station on the main lines of the Southern Pacific system and watch the many trains pass by westbound, loaded with provisions for the sufferers, or the eastbound trains loaded with refugees, who were carried free of charge, to estimate the enormous expense encountered by the railway companies, who bore it uncomplainingly—nay willingly.

The editor of *IRRIGATION AGE* was caught in the "quake" at a point named Pajaro, one hundred miles south of San Francisco, and was detained by a combination of sunken track behind and serious landslides ahead, the train being held up and out of communication with the outside world for over thirty hours. This is an illustration of the many difficulties which railway officials encountered beyond the loss of their main offices in San Francisco and total demoralization of their western terminals. In view of these facts we reiterate that the public generally, and particularly those of the Pacific coast, owe much to Mr. Harriman, his able assistants and the officials of all other railways reaching the Pacific coast. Beyond the immense cost to them through damage to tracks, equipment, etc., it is rea-

sonable to surmise that they have spent a million or more in aid of those in distress. This may be worth while remembering by those who are habitually inclined to criticize railways and their officials.

During the past year many complaints have come to us concerning the manner **Oppressive Use of Power.** in which the Reclamation Service has been handling affairs in connection with development work along the lower Colorado River near Yuma, Ariz. So many complaints were forwarded recently that the editor decided to visit Yuma and secure data from those interested. A careful study of the situation coupled with talks with individuals in and near Yuma brought out many interesting facts.

More than two years before the Reclamation Law was passed by Congress the Irrigation Land and Improvement Company, of Yuma, Ariz., had begun irrigating lands in the Yuma Valley, taking the water therefor from the Colorado River. It had made appropriations of the water of that river, and acquired, by purchase and assignment, prior appropriations, under the laws of the territory of Arizona, making the first appropriator in time the first in right. The men who put their time, money and labor into this irrigation work were offered by Arizona the further inducement that such enterprise should be exempt from taxation for the term of fifteen years. Before the reclamation engineers went into that district the I. L. and I. Company had water running in more than forty miles of main canals and ditches, and was irrigating more than 4,000 acres of theretofore arid lands. It had submitted to the Commissioner of the General Land Office, for approval, its plat showing its system of canals, reservoirs, etc., and the same was approved by Secretary Hitchcock on the 30th of October, 1903, thus giving that company title to the land required for said canals, reservoirs, etc., where the same crossed or was on public lands. This approval was given and these rights acquired, in the face of opposition which was interposed by the Reclamation Service, the latter claiming that the Government might want to enter that field, and the approval of the plat would confer vested rights to pester the Government in its enterprise. Furthermore, many locators under the desert law were allowed to prove up on their claims in that valley by showing that they had a water right from the I. L. and I. Company for a perpetual supply of water.

In the Yuma Valley, below the main canals of this company, lie about 50,000 acres of land, for the irrigation of which the main canals, reservoirs, settling basin, etc., had been constructed before Newell's men got into Yuma, and organized the Water Users' Association. The work of further extensions would have been, at slight relative cost to the company, and was proceed-

ing, and would have been continued as rapidly as the settler could get ready to improve his land.

In the month of February, 1904, the town and county of Yuma were enjoying a prosperity never known before or since, greater than they will know again in the next five years, if the past and present methods of the Reclamation Bureau continue in force. By that time said I. L. & I. Company had expended, in money and labor, on its plant approximately \$300,000. Its engineer and general manager, J. E. Ludy, had then been working for four years, asking and receiving from the company only a bare sustenance, expecting to reap a rich reward in the enhanced value of his large holdings of stock. All the other stockholders felt the same confidence in the ultimate success of the enterprise. The writer, at the time of his visit, learns that in those days, farmers marketing in the town of Yuma their crop of alfalfa, were netting about \$50 per acre on their irrigated lands, which were a part of that great Arizona desert less than two years before, when the Reclamation Act was passed.

At this time, and with a demonstration by private enterprise of what irrigation could accomplish in that valley, Newell's men entered the field, organized the Water Users' Association, and started out on their mission to accomplish the undoing of the I. L. and I. Company. Where slander and libel were inadequate bull-dozing methods were employed. The Standard Oil Company and John D. Rockefeller never employed more unconscionable methods to ruin a competitor in the oil field than have been used by Newell, Lippincott, et al., down in the Yuma Valley. The people were told that private enterprise could not cope with the difficulties of that river; that use or appropriations of the waters of the Colorado River, by private persons or concerns, were invalid, because the river was a navigable stream; that the Government was going to install a plant which would have the right to use the water, under a system capable of coping with all difficulties and that those who did not desert the private concern and agree to take water from the Government would not get water when the private concern had been put out of commission, as it inevitably would be. By such methods further extensions by the I. L. and I. Company became impossible.

What the poor settler down there needed most was the loan of money on his claim to enable him to improve it. This money, but-for Government interference, would have been furnished. The I. L. and I. Company, at that time, was in such good standing financially that a trust fund of two or three hundred thousand dollars was to be raised on the bonds of the company, and this money loaned to the settler, which would have been the means of rapidly filling up and improving the valley.

Before the organization of the Water Users' Association the water right certificates of the I. L. and I. Company passed almost as current among the people, banks and stores in Yuma, as money. After the Reclamation folks began their campaign of extermination to all private concerns, those certificates became discredited. It did not take a prophet to see that, in a conflict between the United States Government, in the hands of men drunk with suddenly acquired power, and blind to individual rights and justice, that there could be nothing but utter ruin to the private concern. These events brought out a few heroes, men who avowed a willingness to stay with the private corporation, that had pioneered the way, and gave the valley its first gleam of real prosperity, and lose all with that company rather than accept the grace held out by the Reclamation Service as a reward for moral cowardice. But there were others more selfish, and less heroic, who considered it the better part of valor to surrender at once to forces that in the end must inevitably conquer, whether right or wrong. And so the I. L. and I. Company was bottled up like Butler in Burmuda, unable to go forward or backward, with contracts requiring it to furnish water to lands constituting about a tenth part of the entire irrigable district—the receipts for maintenance not sufficient to pay the necessary expense of keeping the system up to a proper degree of efficiency.

It was first reported that the Reclamation Service would put a dam 80 or 100 feet high across the Colorado River, twenty miles or more above Yuma, and in that way reclaim many thousand acres of Mesa lands, which could not be reached by canals on the natural level of the river; and glowing pictures were held out of an immense power thus to be created, which would be used in transportation and pumping water on still higher levels. The first literature issued among the people in that valley held out alluring prospects, and in that literature and at public meetings, it was broadly intimated that any citizen who would remain loyal to a private irrigation concern, who would still consider himself bound by any previous contract with it, must be regarded as an enemy to his country.

Irrigation in that valley by private enterprise had theretofore looked good to them. Fifty thousand acres of that rich delta irrigated and cultivated meant much to the people in Yuma County. But this prospect, toward the realization of which more than 5,000 acres had been reclaimed, paled into insignificance in comparison with that great scheme of raising the Colorado River 80 or 100 feet and converting it into a great power, and carrying the water over the great area which it could thereby reach. When the local enthusiasm had been brought as high as the proposed dam, and a proper Socialistic sentiment created, to the effect that the Government should forcibly take possession

of anything it needed to promote its greater enterprise, and pay nothing for the same, the dam suddenly, and without comment or explanation, shrunk down to one only ten feet high.

But, whether ten or one hundred feet be the height of the same, the I. L. and I. Company could not cope with Uncle Sam, and early sought an opportunity to say so, and to ask that it be permitted to retire from a field which the Government claimed for its own, and asked to be compensated for its outlay. It was informed that the Water Users' Association could make no agreement which would bind the Government; neither could the Reclamation engineers. The Secretary of the Interior was written to for advice in the premises. In this letter of inquiry the Secretary was told of the efforts made by the I. L. and I. Company to find some one to negotiate with, and also of the claim that one Morris Bien was making in behalf of the Water Users' Association that all appropriations of water of the Colorado River for irrigation purposes were void, because the river was a navigable stream, and therefore the company had nothing of value. There was inclosed to the Honorable Secretary a brief given the president of the company, reviewing the adjudications of the courts on the subjects of appropriations of water of navigable streams, and as to the extent of the title which the United States has in the navigable waters of the States and Territories. This letter and brief were referred to Mr. Newell's bureau, and in due course a reply came, rebuking the impertinence of one who would deign to lay before the Secretary of the Interior a brief relating to the subject of irrigation in Arizona which did not emanate from Morris Bien, who is an evolution from the engineering service to a legal adviser of that service of the Government. In that brief the question was discussed as to whether it were possible for the waters of the Colorado River to be exempt from irrigation service by private enterprise, because the river is a navigable stream, but when the United States Government wants to appropriate the same water and more for the same purpose, the river becomes a non-navigable stream. The only answer vouchsafed to this question was that it is "irrelevant." In other words, "It's none of your business."

It would be interesting to quote from subsequent correspondence with that branch of the Government, called "U. S. Reclamation Service," of which Mr. Newell is chief, but lack of time and space forbids to follow it further than to say that this correspondence was made necessary in order to find some one, if possible, with whom the I. L. and I. Company could negotiate with preliminary to its giving up that territory, with all its hopes and promises, to the conquerors. In the course of this correspondence the I. L. and I. Company was alleged by the U. S. Geological Survey office to have been accorded a hearing long prior to the time of this

correspondence; with having gone into the district after the Reclamation engineers had entered the field, and by means of lapsed and illegal appropriations of water, attempted to obstruct the Government, etc. These statements were afterward admitted to be erroneous.

An offer was made by the I. L. and I. Company to submit to arbitration the valuation of its property, or to the decision of the Court of Claims, both of which were denied, but instead, a committee of engineers, in the selection of whom it was allowed no voice, was sent down to view the premises, hear evidence and report to the Honorable Secretary of the Interior. They reported that the system was a physical and financial failure, and recommended the payment of \$45,000, on condition that the payee out of that amount, would settle for water certificates issued, amounting to the par value of over \$130,000.

The eighth section of the Reclamation Act provides that the work to be done under it should not interfere with the laws of any State or Territory relating to the control, appropriation, use or distribution of water used in irrigation, *or any vested right acquired thereunder*. In vain has this provision of the law been appealed to, to protect those whose money and labor have gone into what is better known as the "Ludy Canal System." After financial and physical success have, by the methods above recited, been made impossible, this *ex parte* committee taunts the company with the fact that it has not had strength enough to cope successfully with the Federal Government with its millions of money and armies of men.

Forceful possession has been taken by the engineers of lands owned in fee by the I. L. and I. Company. The engineers wanted to construct a levee along the river. Under a provision in the patent for this land, reserving a right-of-way for an irrigation canal, the officers proceeded to construct the levee, claiming it to be one bank of a canal.

A precedent for this conduct is reported to have been made in North Carolina, by an old justice of the peace, who was applied to for a search warrant by a man who had lost a turkey. After examining his form book, he told the applicant that he could not find a form for search warrant for a turkey, but he did find one for a pig, and he proposed to issue a search warrant for a pig, and he said, "while you are pretending to look for a pig, you may find your turkey."

The private concerns engaged heretofore in reclaiming that God forsaken desert are not the only sufferers from the destructive methods used by Government Engineer Lippincott and those under and over him. Business stagnation and bankruptcy have succeeded the era of activity and prosperity which they found in and have driven out of the valley. Paralyzed by the presence and uplifted club of this Government Goliath, the private concerns lack the heart, means or

object to keep their properties up to efficiency. Canals and ditches are becoming overgrown with willows and choked with weeds, while crops are famishing for water, and farms relapsing back into desert places. The owners of these lands now realize they have let go the song bird they had in hand for two vultures hovering over the valley. Already they are circulating and signing a petition to the Government, in which they say, among other facts, that—

"Under these private systems of irrigation the country was being rapidly developed up to the time when the Reclamation Service came into the field, and in fact continued until the uncertainties of their position with reference to a final determination of their rights, the private companies, not feeling justified in perfecting their irrigating systems; from that time the development of the valley practically ceased; without a water supply the lands would deteriorate and go back to their primitive conditions. These facts are self evident."

Many land holders signed up with the Government only after being assured that these canals would be taken over and operated in the interim, and their rights and improvements protected. It is said that nearly every man in the town of Yuma and Yuma County has signed this petition.

Thus disappears the only palliating apology that could have been made for perpetrating these wrongs, viz., that if Peter was being robbed it was for the benefit of Paul. Peter has not consented to the robbery, and Paul now declines to be implicated, even as accessory after the fact.

The people who are being crucified by the policy herein criticized, are as good law abiding citizens as can be found in the whole United States. No one of them, before this experience, could have been made to believe that any department of the Federal Government, in time of profound peace at home and abroad, would use its power in such way as to destroy private property and rights. It has been said that republics are ungrateful. If this conduct, which seems to meet the sanction of Secretary Hitchcock, is approved, it must be added that republics are dishonest, and that all our constitutional guarantees of protection to private rights, "are as sounding brass and tinkling cymbal." There is no better school for anarchy than the oppressive use of power by those who are called upon to administer the affairs of government. There is no surer way to make a good law unpopular than to make of it an instrumentality of oppression and wrong. It is our intention to furnish later information in detail regarding the work and methods in and around Yuma and other centers of Federal activity.

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EDITORIAL NOTES.

ONE of the common practices of high finance is consolidation. Economy of production and improvement in operation assures greater profit. Pioneers of whatever industry it may be have risked initial and experimental stages, and shrewd financiers step in with absorption theories, reaping a harvest far in excess of those whose originality and energy laid firm foundations. It is the spirit of commercialism, and captains of industry, in their insatiate ambition, often use their centralized potency to compel individual independent spirits to their way of thinking.

THE fierce vindictive spirit exercised in contests to crush inferior enterprise is the one most ignoble manifestation. It is the prime occasion which brings criticism and malediction alike on all, or nearly all, our giant industries, and which has inspired our National Executive to numerous prosecutions.

YET minor departments of the government are emulating Standard Oil and U. S. Steel methods and endeavor. Millions of dollars are set aside for reclamation, but did the framers of the National Irrigation Act contemplate or intend to endow a service with coercive powers? Powers to compel unwilling private and corporate canals to yield their legitimate holdings, and make way?

CANAL districts which have had abundant water five to twenty years are threatened with a shortage unless they abandon their identity and pay a price considerably in excess of present cost. If construction of a government reservoir injures priorities, or menaces supply, it indicates a juggling of water measurements, or record.

WAS not the law's intent to provide a way to construct new canals and irrigate new areas? Should the fund be expended to consolidate our interests, increase our obligations, and give us in return just what we had before (with this amendment, that a government agent will lock and unlock our head gates)? Is this the purpose of the law? To supplement where there is adequate supply is well, but the demand should emanate from water users, and not originate from fear excited by assurance of federal attaches that a contingency is imminent which never did exist and can not now exist, unless invasion of government work imperils vested rights?

IMMEDIATELY after the organization of the American Irrigation Federation the *St. Paul Pioneer Press*, the *Los Angeles Times*, the *Redlands Citograph*, publications here and there, discovered (?) "something." Almost verbatim editorials appeared. The singleness

of thought expressed is of itself remarkable coincidence, but diction chosen simultaneously in different parts of the country being so strikingly identical, the wary analytic eye is prone to look for those familiar earmarkings.

IN THE final round-up of the year all of these presumed mavericks of opinion will be found to have the private mark of the National Irrigation Association, and may be driven to the home ranch of Geo. H. Maxwell.

ESTABLISHING a land unit of proper proportion is one of the problems of the reclamation service. It is urged that an irrigation community will support (including villages) an inhabitant to an acre, and theorizing engineers are prone to render deductions in favor of small units.

If all areas to be reclaimed were susceptible of intensified farming and fruit culture, and if there was unlimited market, small units would avail. But a minor portion of the 20,000,000 people (which James J. Hill states irrigable America will support) if engaged in intensive agriculture or horticulture, will oversupply any possible market.

HOSTILE legislation—the menace of obliterated or reduced tariffs—and soil exhaustion, if beet raising is continuous, are obstacles, and crop rotation will be necessary. Inevitable deductions are, after a time cereals and meats must be the basis of our agriculture.

FOR a period, when favored by state or federal patrimony, producers of protected products will flourish. Certain local conditions will in other places give fruit raisers advantages. Climatic or soil conditions, or markets, will assist. Smaller units under such conditions would be favored. But probably nine-tenths of the empire to be reclaimed must be utilized for raising bread and meat.

EVERY interested American should endeavor that settlement upon reclaimed areas be builded on a basis that will endure. False prosperity, based on legislative or temporary contingencies, will eventually collapse and be compelled to readjust itself. Newly developed sections should build upon the safe and sure foundation of ordinary farming; and to do so, sufficient farm units should be allotted to interest ambitious citizens.

IT is not the question of how many acres will "support" a family. No good American ought to be content with a nominal living. Contentment in humble environment will not build up republics, or turn a virgin soil to fruitful fields. Restrictions to "a living" will eliminate ambition and induce inertia. The class

of men who would be content with a mere living will not have ambition to move hitherward, and would be of little use in a new community.

"THERE is so much to do, and so little done." A toiler will do more and deserves more than a half dozen indolents. If national duty includes support of incompetent or shiftless citizens, let the patrimony carry this condition. Recipient must remain away from localities where industry is such an absolute essential to prevent failure. In areas being reclaimed, inducements should be sufficient to attract ambitious, thrifty men.

PRESIDENT ROOSEVELT has cautioned magazine writers and newspaper correspondents against irresponsible, unguarded or erroneous verbosity. An unfair attack will have reactionary effect; an untrue accusation dulls the lance of justice.

HONEST endeavor must applaud executive utterance. Heretofore these notes have affirmed that unjust accusation would provoke revolt. Imputed evil purpose, or wrongfully assailing character, with hope of forcing honorable critics to irrelevant or inconsiderate remark, is one policy of graft.

UNFORTUNATELY, favorites in fiction have left the vistas where they shine as stellar luminaries. David Graham Phillips, Alfred Henry Lewis and Jack London have invaded labyrinthian jungles of political philosophy. Classical attainments and imagination, which serve so well as adjuncts in literary triumphs, creates sad havoc when applied to financial and political essays.

FOR the sake of their own reputations, also because of a hope for a sane adjudication of chaotic conditions, we are impelled to urge our literary friends to exercise moderation; or, better still, to avoid and abandon an endeavor which their endowments and equipment renders a perilous pursuit, a dangerous fancy to indulge.

WHILE frenzied financiering merits severe rebuke, while frenzied scribes are poisoning a public mind, also are frenzied policies indulged in some departments of our national government. Slop-over zealots have untruthfully assailed Western character, and told the world that the West is full of perjurers and thieves. The general accusation almost assures real criminals an immunity, and honest men, to extricate themselves from embarrassing entanglements, appear in mesalliances and unenviable situations.

RIGOROUS policies where crime exists may be the only plan for its eradication, but publications grouping half-constructed initial homestead habitations under a "fraudulent" caption (published by courtesy of United

States) would indicate frenzied officialdom. And all of these malpractices originate in those divisions dominated by Messrs. Newell and Pinchot. Although occasionally censure falls on Mr. Richards, a guerdon for reposing confidence in irresponsible, co-ordinate fellows.

THE PRESIDENT'S admonition to the press is timely, and we indulge the opportunity to suggest a weeding of the Executive Garden. The Newell-Pinchot type has not exemplified the cardinal principles of American citizenship. They possess attributes of tyranny and qualities of incapacity and untruth. Lesser lights—erratic, egotistical engineers, Field of the North Platte, Ross of the Minidoka, and their kindred spirits, might be reduced to spheres of usefulness by puncturing their bubbles of conceit.

ENTHUSIASM in the work of building up communities has made us bold in our endeavor to catch the President's eye. Not like the contemporaneous editor of the *Talisman*, with impudent challenge and deliberate effort, but with effort born of hope that the new and Greater West will contain more of the same big-hearted, self-reliant fellows who have won the admiration of a world.

THE FARMER TO BLAME.

If His Land Suffers From Drought or Lacks Water for Irrigating, When Small Stream Is Nearby,
Says Robert Washburn.

"It is the farmer's own fault if, in these days of scientific discovery, he does not reap all the returns he should from his land, be it located wherever or however it may, in or without the rain belt, so long as there is a small stream with a slight fall nearby." Such was the remark the other day of Mr. Robert Washburn, a man of wide experience in agriculture, horticulture and individual irrigation enterprises throughout the great Pacific Northwest, being at present an extensive owner and operator of Rogue River lands. "Devastation to crops as a result of droughts and barrenness of land from lack of water are two evils that can easily be overcome," continued Mr. Washburn, "if the flow of a little stream is only utilized by any one of the modern mechanical devices now being made for just such work and are already accomplishing for many the desired results. The simplest and most inexpensive of these devices for elevating the water of a stream to a higher level is, perhaps, the hydraulic ram. It is a self-pumping engine that is rapidly fulfilling the need of the farmer and small irrigationist for a sure scheme of getting out of the land all those bountiful returns yielded where water is plentiful."

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KENNEWICK, WASHINGTON.

During a recent visit to the Northwest, a representative of this journal visited Kennewick, Wash., one of the best developed and well advertised points in the West.

The Kennewick Valley, in which the town of that name is located, is in the eastern part of the State of Washington, approximately 150 miles west of Spokane, and 250 miles east of Puget Sound. The country sur-



Mrs. Staley at Kennewick, Wash., Picking \$375 Worth of Strawberries to the Acre.

rounding Kennewick in its natural state was arid, and therefore non-productive. The irrigation canal was constructed by the Northern Pacific Irrigation Company, and was completed during May, 1903. Water is taken from the Yakima River, the intake being about twenty-two miles west of Kennewick, and the canal irrigates approximately 14,000 acres of land. The entire Kennewick Valley borders on the bank of the Columbia River, a navigable stream, and is also on the main line of the Northern Pacific Railway.



A Kennewick Peach Tree Breaking Down with Fruit, which Like All Other Fruits Grown There, Are so Early They Sell at an Enormous Price.

The low altitude, 365 feet above sea level, produces a very mild winter climate, and the earliest growing season in the entire Pacific Northwest, which in turn gives to farmers the very highest prices for early vegetables, berries, etc.

The Kennewick Valley is naturally adapted to the growth of all kinds of fruits, such as peaches, cherries, apricots, European varieties of grapes, strawberries and all kinds of melons, all of which yield bountifully and

pay a handsome profit. The first strawberries shipped from Kennewick last year were sold on the depot platform for \$15 per crate of twenty-four quarts, and as high as \$350 profit per acre was realized from this crop, while a single acre of European grapes paid the enor-



An Alfalfa Field at Kennewick-Finley, Wash., Showing the Fine Lay of the Land.

mous profit of \$800. The farmers, however, have been shipping asparagus and rhubarb for the past thirty days, beginning late in March, and being the first into our northern markets, are paying large profits.

We are presenting herewith four illustrations of Kennewick, which will give a fair idea of that country and its possibilities. The Northern Pacific Railway Company built, owns and operates the Kennewick canal under the name of the Northern Pacific Irrigation Company, which makes it as safe and sure as if controlled by the government. Mr. A. M. Cleland, general passenger and ticket agent, St. Paul, Minn., will gladly furnish additional information. The illustrations mentioned were furnished by the Hanson-Rich Investment Company, Kennewick.



A Vine of Black Hamburg Grapes (European Variety) Grown at Kennewick, Wash., Paying at the Rate of \$800 Per Acre.

\$2.50 will secure for you one year's subscription to THE IRRIGATION AGE and a finely bound volume of the Primer of Irrigation which will be sent postpaid in a few months, when volume is completed. The Primer of Irrigation will be finely illustrated and will contain about 300 pages. Send post office or express money order for \$2.50 and secure copy of first edition.

KANSAS-COLORADO IRRIGATION SUIT.

Colorado Holds That Kansans Are Not Injured.

The brief of the attorneys for the State of Colorado over the suit over the diversion of the waters of the Arkansas River for irrigation purposes has been filed with Attorney-General Coleman, of Kansas. The brief is to be filed with the United States Supreme Court for use in the final hearing of the case. Mr. Coleman says that he expects a decision in the case some time this fall. The final arguments will have been made before the adjournment of the court for the summer vacation and the decision probably will be rendered shortly after the court convenes in October.

The attorneys for the State of Kansas made the claim in their brief that the diversion and use of the

tially two rivers, one a perennial stream rising in the mountains of Colorado and flowing down to the plains, and this Colorado Arkansas, when the river was permitted to run as it was accustomed to run, prior to the period of irrigation, poured into the sands of western Kansas, and at times of low water the river, as a stream entirely disappeared. Its waters were to some extent evaporated, and, as to the residue, were absorbed and swallowed up in the sand. So that from the vicinity of the state line between Kansas and Colorado and Kansas easterly, as far, at least, as Great Bend, if not farther, at such times of low water there was no flowing Arkansas River. Farther east, however, a new river arose, even at such times of low water, and partly from springs; partly from the drainage of the water table of the country supplied by rainfall, and partly from the surface drainage of an extensive territory, the river gradually again became a perennial stream, so that



waters of the Arkansas in Colorado is a great injury to the people of Kansas. They asked that the court enter a decree prohibiting any diversion of the waters of the river within the State of Colorado except for domestic use.

In commenting on this section of the complaint, the brief filed by the attorneys for Colorado says: "It will be observed that if the prayer of the complainant should be granted as asked, it would mean the destruction of millions of invested capital, the driving out from their homes of a large population of industrious people, and the return of a large, rich and productive territory to a condition of arid desolation. The demand on the part of the State of Kansas is based upon the alleged fact that the diversion of the waters of the Arkansas River for the purpose of irrigation in Colorado has seriously injured the people living within the valley of the Arkansas within the State of Kansas."

The contention of the defendant, State of Colorado, as to facts, may be concisely stated as follows: "The Arkansas River, popularly so called, is substan-

South of Wichita, and from there on to the mouth of the river, the Kansas Arkansas, as a new and separate stream, had a constant flow. Such, as the river was accustomed to flow, was the Arkansas of the period prior to irrigation. It was a 'broken river.' It is true that at all times in early years the Arkansas River, at times of flood, or of what might be called high water, has a continuous flow from its source to its mouth, but a flow, even in times of flood or high water, which diminished through the sandy waste east of the Colorado State line above described, so that oftentimes, even in a flood in Colorado, would be completely lost before it had passed over this arid stretch of sandy channel, and high water would always be diminished in flow through the same stretch of country. This river is as if it were a current of water passing over a sieve; if the current be slow and the volume not excessive, all of it sinks through the sieve and none passes beyond; when the current is rapid and the volume is large, still a large amount sinks in the sieve, and the residue passes on beyond."

"The irrigators of Colorado have confined their actions to the Colorado Arkansas above described. They have taken the waters of the perennial stream before it reaches the sieve, through which it wasted; they have lifted that stream out of the sandy channel in which land; carried the body of it along a higher level than

the diversion of this water in Colorado, the carrying of it forward on a higher level, the return of waters partly through seepage and partly through direct delivery at waste gates, and the effect of this process in extending eastwardly the perennial flow, will be fully discussed in the course of the arguments to follow."



The Deep Canyon of the Uncompahgre, From the Head of the Tunnel. Which Will Pass 2,000 feet Below the Vernal Mesa, and Carry Water and Prosperity to Thousands in Colorado.

where it was accustomed to run, and they finally restore it, practically undiminished in volume, so far as regards practical use, at points in the ancient channel farther east than the river at low water was accustomed to flow before the period of irrigation. The effect of

In conclusion, the attorneys for the State of Colorado say that the people of Kansas have not been injured, and ask that if such be found to be the case that the bill of complaint be dismissed.

INDIAN FIRST TO IRRIGATE.

American Desert Watered by Canals When Columbus Came Over.

American irrigation was old when Rome was in the glory of its youth. The ancient aqueducts and subterranean canals of South America, extending for thousands of miles, once supplied great cities and irrigated immense areas. Centuries before the venturous

desert, wearily and painfully executing the commands of an American Pharaoh.

Coming down to a period less remote and only slightly less interesting, is the first page of modern American history. Here, in the sixteenth century, Coronado, the first great American explorer, swept up the Rio Grande valley and journeyed as far north as Kansas. In New Mexico he found a pastoral race dwelling in pueblos and practicing the gentle art of irrigation as had their forefathers, perhaps as far back as the days



The Idan-Ha Hotel, Boise, Idaho, which is to be official headquarters during Irrigation Congress.

Norsemen landed upon the bleak and inhospitable shores of New England a large population dwelt in the hot valleys of the far Southwest. From the solid rock, with primitive tools of stone, they cut ditches and hewed the blocks for many-chambered palaces, which they erected in the desert or on the limestone ledges of deep river canyons.

These voiceless ruins, older than the memory of many centuries, tell the story of a thrifty, home-loving and semi-cultured people, concerning whose fate history brings us no word. In these palaces and in many miles of canals we may almost read the story of another Egypt—a people toiling under the burning sun of the

of Abraham. Certainly their agricultural methods were in no wise different from those which prevailed in the days of the prophets. Even unto this day their grain is gathered in great willow baskets, is threshed by the old process.

Some of these thoughts came to the government engineers as they ran their lines of levels in the valley of Salt River in Arizona, and it seemed to them a proper task for the greatest nation on earth to restore once more the oases of verdure which the desert had long ago obliterated.

During the last quarter of a century a crop producing area of 10,000,000 acres, or another State of Massa-

chusetts, has been wrested from the dessert. Irrigation canals long enough to span the earth twice and representing an outlay of \$90,000,000, have been built. Every year this area returns a harvest valued at more than \$150,000,000, and 2,000,000 people dwell in prosperity and contentment where only a short time ago the wilderness reigned.

Uncle Sam is today the largest owner of the great American dessert, no doubt because it was not considered worth stealing. For many years the sentiment has been growing that the government should make habitable this vast empire which is so great potentially.

STEALING A RIVER.

Under this headline a leading Kansas City daily has the following to say:

The feat of the man who stole a redhot stove is far surpassed in larcenous proportions by the people of Colorado, if we are to believe the testimony adduced in the case of Kansas versus Colorado, which is pending in the United States Supreme Court. This testimony is mostly in the form of photographs, taken, as usual, before and after, and the Kansans claim that these pictures demonstrate the fact that Colorado has stolen and carried away the Arkansas River, contrary to the peace and dignity of several thousands farmers in Western Kansas, who desire to use its magic waters for irrigating purposes, to make some 300,000 acres of desert land blossom like the rose.

In addition to the pictures Judge Ashbaugh, leading counsel for Kansas in the litigation, has just completed an abstract of the testimony taken in the case, consisting of five volumes of 1,000 typewritten pages each. But the sixth volume, containing 300 pages of photographs, is relied on chiefly to establish the fact that where once the Arkansas rolled in plenteous majesty through the plains of Colorado and Kansas, dispensing the choicest blessings of fertility to the thirsty soil, and watering the crops of the just and the unjust alike, now the unjust in Colorado have pilfered all the water and left Kansas as dry as a bone. The Kansans claim priority rights to this water. They have eight or nine big ditches which they say were built before Coloradoans began to irrigate anything but their throats, and these ditches used to be brimming full before Colorado swiped the water and turned it into ditches which were built in base imitation of the Kansas kind. These pictures, the Kansans claim, will show that their ditches now haven't even a cherry left at the bottom, as evidence that they were intended for liquid refreshment, or as a guarantee that rivers, like the constitution, follow the flag, which waves over every school house in Kansas.

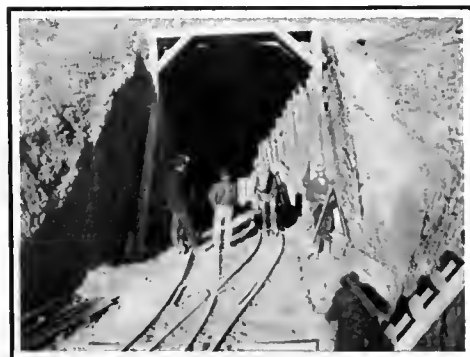
The 300,000 acres in Kansas which are left to the tender mercy of the Kansas prohibitory law are unsurpassed for the culture of sugar beets, alfalfa, melons and fruit, and it remains to be seen whether the Supreme Court of the United States will countenance this wholesale theft of the once freely flowing Arkansas River.

C. J. BLANCHARD.

Talks About Reclamation Work.

One of the most surprising features connected with the work of the Reclamation Service, as well as the one affording highest gratification, is the cost of structures compared with those which have become familiar to engineers in the East.

When the reclamation work was inaugurated it was a matter of conjecture whether or not the standards of cost for dams, canals, etc., that had been established by engineering practice in the eastern part of



Constructing a Tunnel Through Mountain for Carrying Water for Irrigation.

the country could be relied upon as a basis of estimates of the cost of the proposed western structures. As the work has progressed it has become more and more evident that many classes of engineering work in the West can be performed considerably cheaper than in the East, and at the same time the natural conditions are such that these structures are more economical and effective.

If we take, for example, the three great masonry dams now being erected for the purpose of storing water, viz., the Roosevelt dam in Arizona, the Path-



A Pleasant Valley in the West.

finder dam in southeastern Wyoming, and the Shoshone dam in northwestern Wyoming, we shall find that the effective storage capacity and costs are far below those of some of the great eastern dams like the New Croton in New York and the Wachusett in Massachusetts. The heights of these dams are as follows: Roosevelt, 280 feet; Pathfinder, 210 feet; Shoshone, 308 feet; New Croton, 297 feet, and Wachusett, 207 feet. These heights are measured from the foundation stones to parapet in each case, and they show that the Shoshone is the highest, while the New Croton is second and the Roosevelt third. If, however, the height above the river bed is considered, that is, the effective

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storage height, the New Croton is the lowest. The order is then as follows: Shoshone, 240 feet; Roosevelt, 230 feet; Pathfinder, 200 feet; Wachusett, 185 feet, and the New Croton, 157 feet. In other words, about 50 per cent of the masonry in the New Croton dam is below ground and is serviceable for foundation purposes only.

It is interesting to note the comparative reservoir capacities. While the New Croton dam is the largest in the world from the standpoint of its amount of masonry, the storage capacity of the reservoir formed by it is by far the lowest of any of those above mentioned. In fact, from a standpoint of storage economy, the New Croton reservoir is one of the poorest that has been constructed in recent years. The dam contains 833,000 cubic yards of masonry and was erected

storage is therefore only \$22.95, as against \$1,900 for the New Croton, and \$238 for the Wachusett. Similar figures for the Shoshone dam, the highest in the world, are: Cubic yards of masonry, 69,000; cost, \$1,000,000; capacity of reservoir, 20,000,000 cubic feet, or a cost per million cubic feet storage of \$50.35.

These extremely low costs have seldom been equaled in the history of reservoir construction, and are due largely to the excellent natural facilities which are found in the rugged western country. From this fact it must not be inferred that these western structures are simple engineering works. On the contrary, owing to their isolated location, their inaccessibility by rail and often by wagon, and the erratic and torrential character of the streams, they involve problems which tax the skill and ingenuity of their builders to the utmost.



Road Leading to Perrine's Ranch near Twin Falls—Idaho.

at a cost of \$7,600,000. The capacity of the reservoir formed by it is 4,000,000,000 cubic feet, or a cost of \$1,900 per million cubic feet storage. Similar figures for the Wachusett dam show that it contains 280,000 cubic yards of masonry, and was erected at a cost of about \$2,000,000. Its storage capacity is 8,400,000,000 cubic feet, or a cost of \$238 per million cubic feet storage. In contrast to these excessive costs the three western dams appear remarkable. The Roosevelt dam, for example, contains 350,000 cubic yards of masonry, erected at a cost of \$3,850,000. The capacity of the reservoir is 61,000,000,000 cubic feet, or fifteen times that of the New Croton, and about seven and a half times that of the Wachusett. The cost of this dam per million cubic feet storage is only \$63.16. Even more remarkable appears the Pathfinder dam. It contains 53,000 cubic yards of masonry, erected at a cost of \$1,000,000. The capacity of the reservoir is 43,560,000,000 cubic feet, or more than ten times that of the Croton. The cost of the dam per million cubic feet

It is most fortunate that these reservoirs provide enormous storage at relatively low cost, otherwise their construction would not be feasible, as the irrigated land could not bear the expense of the costly structures of the East with their limited storage capacity.

The Croton dam, if it had been constructed in Salt River Valley, in Arizona, for irrigation, would only supply 23,000 acres, and irrigators would have to pay \$330 an acre for stored water, as against \$20, the estimated cost from the Roosevelt dam.

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THE SHOSHONE RESERVATION—HOW TO GET LAND.

**One-Third of Purchase Price Payable Down—25 Cents
an Acre Yearly Until Balance of \$1.50
an Acre Is Paid.**

The general land office has issued the following circular with reference to the proposed opening of the Shoshone or Wind River reservation in Wyoming.

The ceded portion of the Shoshone or Wind River

ervation within two years after the opening are required to pay \$1.50 per acre, but in homestead entries made thereafter the sum of \$1.25 is to be paid. Fifty cents per acre is to be paid at the time of making the entry and 25 cents per acre annually thereafter until the price provided for has been fully paid. Lands entered under the townsite, coal and mineral laws must be paid for in amount and manner as provided by said laws.

Notices of locations of mineral entries are required to be filed in the local land offices of the district in which the land is situated, and unless entry and payment shall be made within three years from the date of location, all rights thereunder shall cease.



Near the Site of the Sawmill in the Ancha Mountains, Where 800,000 Feet of Lumber Have Been Cut for the Salt River Dam in Arizona.

Indian reservation in the State of Wyoming, which embraces the land lying north and east of the Big Wind River, is to be disposed of under the provisions of the homestead, townsite, coal and mineral land law of the United States, and will be opened to settlement and entry, and by proclamation the President will prescribe the manner in which such lands may be settled upon, occupied and entered by persons entitled to make entry therefor, and no person will be permitted to settle upon, occupy or enter said land except as prescribed in said proclamation until after the expiration of sixty days from the date when the same is opened to settlement and entry.

It is also provided that the rights of ex-soldiers and sailors, under sections 2304, R. S., shall not be abridged.

All persons making homestead entries in said res-

In case any entryman fails to make any of the payments for the land, as provided, within the time stated, all rights covered by such entries shall cease, and payments which have theretofore been made will be forfeited and the entry held for cancellation.

Commutation of homestead entry may be made of these lands under section 2301, R. S., but the parties will be required to pay the price for the land as fixed by the act.

After the expiration of five years from the date of the opening, all the lands then undisposed of, except mineral and coal lands, shall be sold to the highest bidder for cash at not less than \$7 per acre, and any of such lands remaining unsold after eight years from the date of opening may be sold to the highest bidder for cash without regard to the minimum limit of price.

The ceded portion embraces about two-thirds of

the land within said reservation and contains approximately 1,150,000 acres.

When instructions relative to said opening have been issued to the local offices at Lander, Wyo., due notice thereof will be given to the public through the press.

The date set for the opening is fixed by law as June 15, 1906, but owing to the fact that the Big Horn and Wind rivers at this season of the year, on account of the melting snow in the mountains, are at flood, and would make it difficult, if not impossible, for entrymen to reach the land thrown open, it has been decided to change the date.

Selections of the land will be by lottery; that is, the name, etc., of entryman will be placed in a sealed box and drawn, and they receive preference in the order in which the names are drawn.

UNCLE SAM AS A CEMENT MANUFACTURER.

Uncle Sam wants Portland cement and wants it badly. With twenty-four big irrigation projects under construction requiring hundreds of thousands of barrels of cement, the engineers are finding it next to impossible to obtain anything like the quantity needed. The unprecedented demand for this commodity all over the West has already overtaxed the capacity of the mills, and almost without exception the government's requests for bids are turned down. Apparently no manufacturers west of the Mississippi are able to supply new orders. In reply to inquiries from the government they state that, owing to the unusual demand new orders can not be accepted for several months to come. Recently proposals were requested from eight manufacturers and dealers in cement for 2,000 barrels required on an Idaho project. Only one proposal was received and that was at a rate 50 per cent higher than the firm would have sold for a few months ago. Still later invitations for bids for several thousand barrels were sent to twenty-three dealers. Again but one firm submitted a bid, and this was nearly 60 per cent higher than the normal profitable rate of sale by this firm. Other attempts to purchase cement have been similarly unsuccessful.

The Reclamation Service is gravely concerned. It has let contracts for structures involving millions of dollars, and a failure to secure cement as needed, entering as it does so largely in the work, will be disastrous. Owing to the inaccessibility of many of the government works, the transportation of cement is difficult and costly. This was particularly the case in Salt River Valley in Arizona, where the great distance from existing mills and the expensive wagon haul, made the cost prohibitive. After making thorough investigation of the cost of bringing in cement for the Roosevelt Dam and other structures, the government erected its own mill and for several months past has been turning out daily hundreds of barrels of first-class cement at a price far below the cost of cement shipped in. It is known that materials required for manufacturing cement of good quality exist near several of the other projects, and private parties should embrace the opportunity to go into the business. From the present outlook, however, the government seems to have a choice of shipping from the far Eastern seaboard or from Europe, or of manufacturing its own cement.

IRRIGATION IN WYOMING.

The *Omaha Bee*, in a recent issue says:

Numerous irrigation projects are being brought to the front in Wyoming under the Carey act, which grants water rights to people who will develop land and ditches. W. H. Knepper, of Buffalo, Wyo., was in the city Tuesday booming his new project by which he proposes to



U. S. Senator Newlands and Congressman Mondell Inspecting Irrigation Work

water 10,000 acres in Johnson county near Kaycee. It is called the Sahara ditch, and is situated 100 miles from a railroad midway between the Burlington and Northwestern railroads.

"The State sells this land for 50 cents an acre and regulates the price to be charged for the water rights. Many of these enterprises are coming to the front in Wyoming which bid fair soon to transform this State into one vast irrigated farm," said Mr. Knepper.

REPORT DAMAGE SLIGHT.

C. J. BLANCHARD.

"The newspaper reports to the effect that the Pathfinder dam and the Government bridge were damaged to the amount of \$100,000 by the recent floods on the North Platte are absurd," said Charles E. Wells, supervising engineer of the Reclamation Service, today.

"It is true the floods were unprecedented. The hydrographer of Wyoming stated to me that in his experience of about ten years in gauging the rivers of Wyoming, he had never known the streams to break up so early in the season. The ice usually remains in place and is thawed by the action of the sun and passes off without injury. Although the high water caused much

WELL! WELL! WELL!

The *Pioneer Press* of St. Paul must be in close touch with "the remains" of the National Irrigation Association if one is to judge by the following editorial published in the issue of that journal of January 14, published, evidently, after some representative of that association had read in the day's news of the formation of the American Irrigation Federation.

In a former issue appeared a report of the Federation meeting recently held in Omaha, and we will let our readers judge after comparing the following which organization stands for what is right and whether a body of men organized to protest against what they believe to be detrimental to public good is to be censured by a metropolitan daily, the editors or owners of which are in sympathy with the plans of that associa-



A Natural Reservoir, to be Drawn on for Irrigation.

damage to the railroad and highway bridges, the Government works experienced little damage.

"The cost of repairing the Government bridge, which is a common wooden pile structure instead of a steel bridge, as stated in the dispatches, will probably not exceed \$500. The damage to the contractors at the Pathfinder dam by reason of the floods will only amount to a few hundred dollars, the total amount of damage to the contractors and the Government amounting in all to about \$1,000. The floods occurred two months earlier than usual."

tion. Those who are acquainted with the literary style of the head of the Irrigation Association is led to believe that that gentleman was either in St. Paul when the article was written or assisted in framing the article by mail.

Attention is called to the paragraph in which an attack is made on the National Irrigation Congress which was used to build up the association, which the *Pioneer Press* champions. The reference to the Congress "as a pirate craft cruising in the selfish interests of speculators and monopolists as against the small home builder" is so manifestly false and misleading as to place the editor of the *Pioneer Press* in the position of a man writing about topics of which he knows nothing. The ignorance of the *Pioneer Press* is pitiful, to say the least. It is safe to say that this editorial was prepared under the guidance of either George H. Maxwell or his man Beardsley with the sole object in view of reproducing the matter in bulletin form and scattering it broadcast among the papers of the country so

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that the prestige of so strong a publication would lead other publishers to accept it as truth, this latter being impossible were it known that it emanated in the offices of the National Irrigation Association.

We reproduce below the editorial mentioned:

"In the evolution of schemes for thwarting the work of a Christian church the devil has now got beyond the simple expedient of joining it himself, with the purpose of sowing dissension among the brethren and so breaking it up. That game has been so often played, and the interloper so often photographed, that he is too easily detected when he offers himself for baptism. Instead, he now gathers his servants into a church of his own, labels it 'Christian,' and employs smooth tongued 'evangelists' to proclaim that there alone is the gospel of righteousness preached in all its purity.

"Similar to the course pursued by the arch-enemy of man is that now adopted by the enemies of the national irrigation law, the advocates of land monopoly and the men who oppose the repeal of the land laws—now perverted almost wholly to purposes of fraud—in organizing the so-called 'American Irrigators' Federa-

all their previous record proclaims them the enemies of everything sought to be accomplished by the National Irrigation Association, in the support of whose work between three and four thousand of the most distinguished citizens of the United States are co-operating.

"These men are smooth of tongue, and adepts in disguising their real purposes by circulating much of the literature of the genuine irrigation propaganda. But the press of the country should take early warning of their real objects, the accomplishment of which would spell ruin to everything which President Roosevelt and his followers have sought through the establishment of the reclamation service."

NOTES.

The following from *The Portland Oregonian* of a recent date expresses the feeling of the majority throughout the West regarding the best method:

W. J. Furnish, of Pendleton, has just completed an irrigation ditch which will water 20,000 acres of land. The long-expected government irrigation projects are still "pending," although Oregon has contributed



A Western Scene.

tion,' the formation of which, at a meeting in Omaha, was announced in Thursday morning's dispatches.

"The men most prominent in that meeting, with some exceptions, have been heretofore among the most active in opposing the beneficent work of the National Irrigation Association. They have demanded the subordination of national irrigation to private projects. They have opposed the limitation of individual holdings in irrigated tracts to 160 acres or less, and demanded that capitalists be permitted to absorb all the government land they can pay for. They are the enemies of Secretary Hitchcock in his efforts to check the absorption of the public lands into vast holdings by the fraudulent use of the timber and stone act, the desert land act and the commutation clause of the homestead act.

"It is the purpose of this new organization to pick up the derelict irrigation congress—abandoned by the practical workers of the National Irrigation Association as no longer serving any useful purpose—and use it as a pirate craft cruising in the selfish interests of speculators and monopolists as against the small home-builder. They regard the home-builder as an obstacle in the way of 'enterprise.' In their view, one great energetic landowner, occupying ten thousand acres and employing a thousand peasants, does more to 'build up the country' than a thousand independent farmers each tilling his own irrigated ten-acre plat. They may deny this, but

vast sums to the reclamation fund. Private enterprise is sometimes, in fact generally, hampered for want of funds, while the government is seldom troubled from this cause. But when it comes to doing things, the private individual or corporation has the government distanced so far that it is not sighted until a year or two after the private enterprise is perfected. The government may some day build an irrigation canal in Umatilla county, but from present appearances Mr. Furnish will be picking peaches from the orchards on his irrigated land before the water is turned in the government canal.

"A-GOIN' SOME."

The Kansas cyclone, without much formality, had picked the wandering tramp up, whirling and twirling him about unmercifully, finally landing him abruptly in the yard of a minister's home. Soon the storm was all past and the good minister bestirred himself to assist the unfortunate. The tramp was pulling himself together when the minister came up.

"Are you hurt much?" asked the minister.

"No."

"Any bones broken?"

"No."

"The Lord must have been with you."

"Well, if He wuz He was a-goin' some."

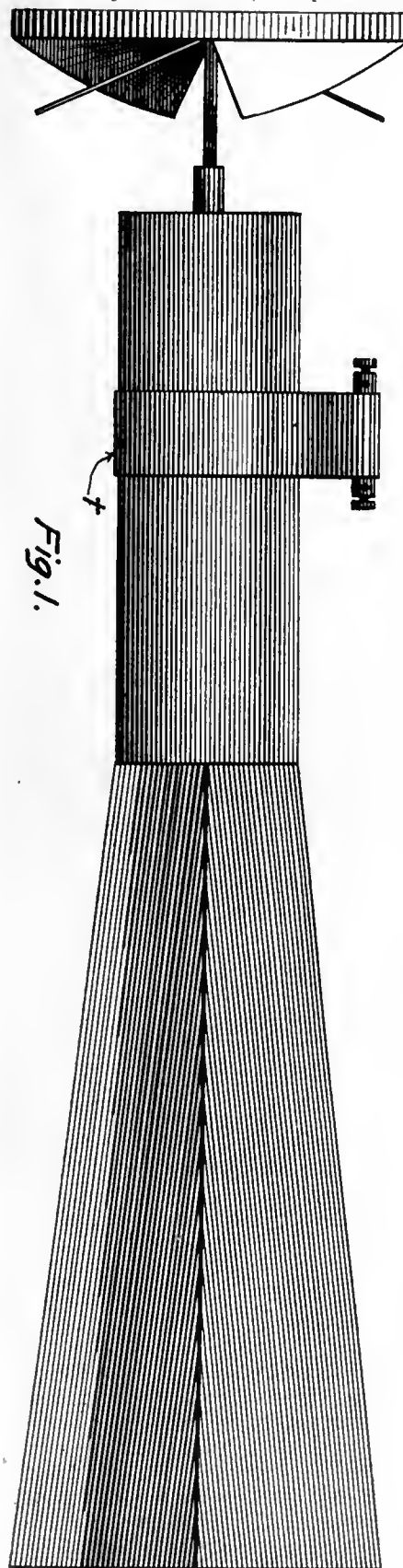
PRACTICAL CURRENT METER.

BY CURT H. EIFFERT AND C. A. BOCK, ENGINEERING
DEPARTMENT, CORNELL COLLEGE, IOWA.

The accompanying illustrations show the result of an attempt to produce a cheap yet practical current meter. The instrument was designed merely for experimental purposes, but since its completion and successful trial there seems to be no reason why similar machines could not be constructed for practical use.

The materials needed for the outfit are some rather stiff sheet tin, a good tin can cover about three inches in diameter, a good knitting needle or other light steel shaft, some insulated copper magnet wire, a small iron bolt, a small strip of sheet copper and a dry battery. The wheel is made of the can cover. First the cover is accurately centered and a hole punched to fit the shaft. Next the blades of the wheel may be cut as shown by the dotted lines in Fig. 3. The turned-over rim of the cover, which ought not be more than $\frac{1}{4}$ inch wide, is left intact, fastened to and stiffening the wheel at the uncut parts at the outer edge of the blades. The blades may now be bent back to the proper angle along the lines 1, Fig. 3. To the shaft is fixed a small wooden cylinder s, Fig. 2, carrying a longitudinal narrow strip of copper c. The body of the machine consists of a tin cylinder containing suitable bearings for the shaft, with a thrust bearing in the rear. A hole is cut in the top of the cylinder through which to make the electric connections. The parts of the cylinders, with the shaft and its bearings, must be carefully assembled and well soldered. This requires a little accurate work, but can be quickly and neatly done by any tinsmith. The tail is made of two flat pieces of heavy sheet tin, each cut with a slit half way along the center line from opposite ends. These are well soldered together at right angles and soldered to the rear end of the cylinder. A small cylindrical box b, Fig. 2, with a hole in the end slightly larger than required for the shaft, is soldered to the cylinder. When filled with oil this little box effectually prevents water from entering the machine. Now the wheel may be soldered to the front end of the shaft. The electric connections are made by means of two copper strips d, Fig. 2, fixed in a block of wood w, which fits the opening in the cylinder. These are so bent as to come in perfect contact with the strip c, at every revolution of the shaft, and yet rub lightly enough to obviate needless friction. When the block is carefully adjusted it is fixed in place by melting around it the pitch from the top of an old dry cell. The binding posts p, are also taken from an old dry cell, connected one each with the copper strips d, and fixed in place by surrounding with pitch. This contrivance is further strengthened by a band of heavy tin t, Fig. 1, passed over the pitch-covered block and around the cylinder, being rigidly soldered to the latter. The whole arrangement can be neatly finished by smoothing over with hot pitch. To this band may be fastened rings for hanging a dead weight and for the suspension of the machine itself by means of a cord. Insulated wires connect the binding posts of the machine with the "ticker" or recording device, Fig. 4. This consists simply of a small electro magnet m, made by wrapping the iron bolt with a small quantity of insulated magnet wire, and a bent strip of tin n for sounder, which is regulated by the screw x. A single cell of

dry battery is sufficient to operate the sounder. The machine as actually constructed, complete with record-



ing device and dry cell, costs the makers a total cash investment of 45 cents.

The instrument may be rated by any of the standard methods and a table prepared for its use. As each turn of the wheel is announced by a click of the sounding device, these clicks must be counted and timed. This is easily done and answers the purpose very well, but if desired, a better electric recording device could,

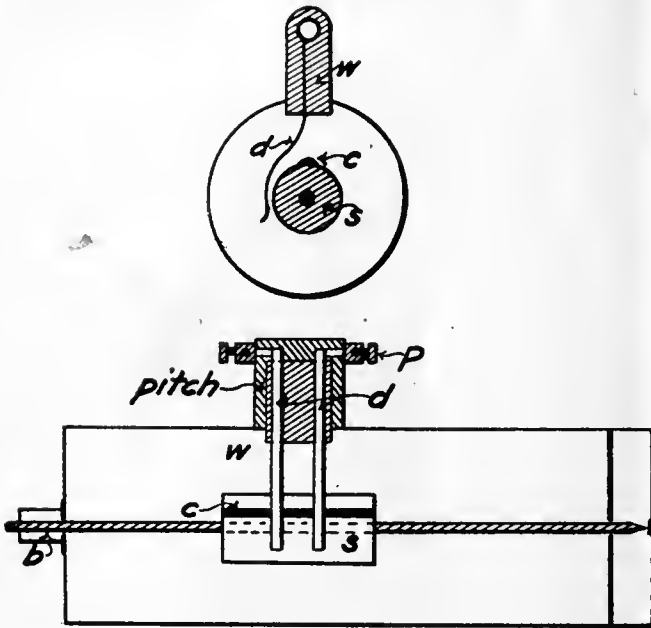


Fig. 2.

with a little ingenuity, be easily constructed.

While this machine will not compare in accuracy and durability with a standard high-priced current

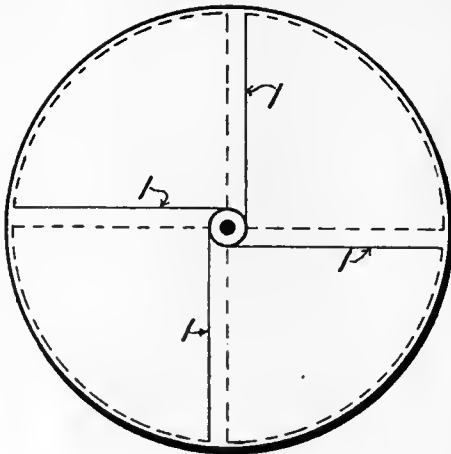


Fig. 3.

meter, the results obtained will be sufficiently reliable for many practical purposes. No essentially new ideas are embodied in its make-up. Its construction is the result of the writers' regret that the high price of standard manufactured current meters forbids their use in many instances where some kind of a meter could be used to advantage, and a speculation as to the possibility of evolving a "home-made" substitute. To the consideration of these who may have shared in this speculation and regret the above results are respectfully submitted.

POISONING CUT WORMS.

A recent bulletin received from the Oklahoma Experiment Station gives the following mixture for poisoning cutworms. It says:

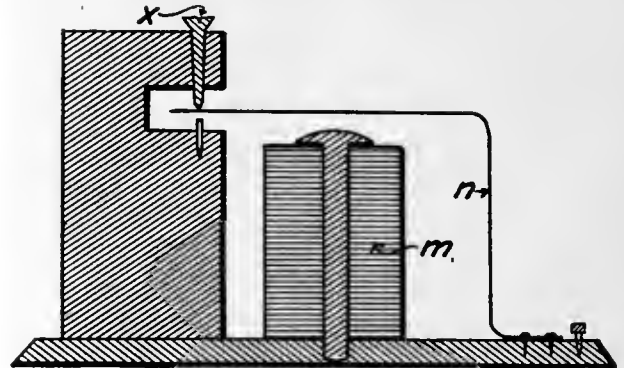


Fig. 4.

Further experiments in poisoning cutworms, which have been working on wheat and alfalfa, have shown the following mixture to be superior to spraying with Paris green, as formerly recommended:

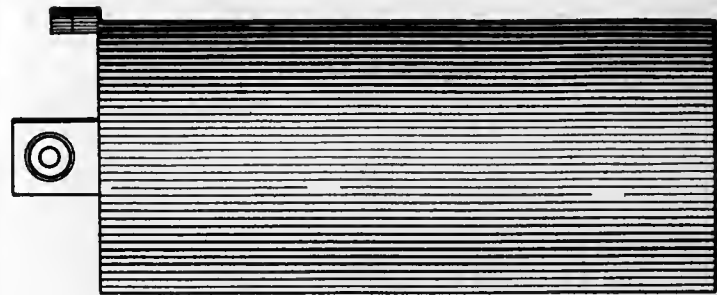


Fig. 5.

Thoroughly mix, while dry, one pound of Paris green and fifty pounds of wheat bran, make moist, but not sloppy, by adding water in which a quart of cheap



Current Meter Complete.

molasses has been dissolved. Place this mixture in spoonful piles where the worms are working. It attracts the worms from the wheat and oats. It is also good grasshopper poison.

FARM MACHINERY INVESTIGATIONS.

Address by Prof. C. J. Zintheo Before the N. A. A. I. and V. M.

WHAT MODERN MACHINERY SAVES.

The success of agricultural pursuits depends primarily upon the accomplishment of the largest possible results at a minimum cost. For this reason agricultural implements are bound to become more and more important, because mainly through them can the farmer reduce the cost of production. To illustrate this it is only necessary to state that in 1830 it took over three hours' labor to raise one bushel of wheat, while in 1896 it took ten minutes, making a difference in the cost of labor in one bushel of wheat between 18 $\frac{3}{4}$ cents and 3 cents.

In 1850 the labor represented in one bushel of corn was four and one-half hours, while in 1894 it had been reduced to forty-one minutes. In 1860 the labor in one



Prof. C. J. Zintheo,
U. S. Dept. of Agriculture.

ton of hay, in bales, represented thirty-five and one-half hours, while in 1894 this labor was reduced to eleven and one-half hours—or from a cost of \$3.00 in labor to \$1.29. The American farmers of today, with less than one-third the labor of the country, produce enough food to support not only themselves but the other sixty-seven per cent. of people that live in the cities, and exported farm products during the year 1904 to the value of \$960,000,000. Much of the credit of this great achievement is due to the American geniuses who have developed the modern farm implements and have supplied our farmers with tools by which they are able to produce more cheaply than any land under the sun, thereby enabling them to sell their products in the open markets of the world, in competition with the poorly paid laborers of other countries.

The American farmers buy annually \$100,000,000 worth of farm implements, and the total value of machinery on the farms in this country is \$761,261,000. On this last investment the farmer ought to make a reasonable interest, and for this reason it is of great im-

portance that the implements which he buys should meet all the requirements for which they were purchased. The efficiency of an implement does not depend entirely upon the kind of work it does, but also upon the power required to do the work, the simplicity of construction, the strength and durability of its material, and its adaptability to varying conditions. In order to judge the practical value of any machine, it is necessary that it be subjected to a careful, well arranged and impartial test. The farmers are not able to conduct such investigations nor are the manufacturers able to pass impartial judgment on their implements. It is, therefore, of great value to have the machines and implements tested by competent, disinterested parties. Such investigations are quite new in this country, but they are not new in most of the European countries.

Since 1860 there have been conducted in Sweden trials of farm implements, either at the request of agricultural societies or in connection with agricultural fairs, but they were of little importance until the government made appropriations for the expense of conducting these trials, which they did as early as 1886.

In 1896 the Swedish government started the first official station for field trials of agricultural implements. In these trials were included seeding machinery, fertilizer spreaders, beet sugar tools, plows, harrows and land rollers, hay presses, cream separators, churns and butter workers, as well as pasteurizers and milk coolers.

It was soon learned that such trials were not only of benefit to the farmers in choosing their machines, but they were of great value to implement manufacturers in that they pointed out defects in construction and weak points in the design of the machine. The chief reason for the rapid progress which has been made in Sweden in the manufacture of agricultural implements and dairy machinery is ascribed to impetus given through these official tests. As is well known, Sweden supplies dairy machinery to practically all of Europe, and has a very large trade in Siberia, as well as other parts of the world.

The Swedish government was urged by the implement manufacturers to appropriate money for the permanent establishment of experiment stations for the testing of implements. This was accomplished by a donation from the Separator Dairy Machinery Company, which in 1896 presented to the Department of Agriculture 100,000 crowns, of which 10,000 crowns was to be spent annually in farm machinery investigations. Two experiment stations were established in connection with the agricultural colleges, and equipped with instruments for conducting the experiments, which have been carried on regularly since that time, and bulletins of considerable merit have been issued.

Since 1877 field trials with farm implements have been conducted in Norway as a branch of the investigations of the Society for Norway's Welfare. The results of only part of these experiments have been published.

In Denmark farm implement experiments have been carried on at different times since 1872. At first they consisted of competitive field trials, at which medals and prizes were awarded, but since 1896 no awards have been made. The tests are now conducted mostly on implements that are new and not well known in the country. In this way they prove to be of great value, both to the farmers and implement manufacturers, in the introduction of new machinery.

The little country of Switzerland has for years been making farm implement field exhibits, under the auspices of the agricultural societies. These exhibits are well advertised and the farmers from far and near come and receive instructions in the use, construction and operation of the various kinds of farm implements.

Belgium has for several years been giving considerable attention to the subject and has made extensive tests of farm implements and machines, in connection with the courses of instruction on the subject, maintained at all of the leading agricultural institutions of the country.

Italy has recently established farm implement experiment stations.

Russia conducts annual field trials with foreign-made implements, at the agricultural colleges, and the students obtain practice in judging and comparing the parts of different makes of implements. Even in far-off Siberia the writer has the privilege of taking part in the field trials between various makes of American binders and reapers. The trial was held at the Agricultural College, at Tomsk, Siberia. After the contest the machines were taken to pieces by the college students and each part studied in detail, under the supervision of the college director and the instruction of the American experts. Russia has also established in Moscow and St. Petersburg permanent implement museums, in which are exhibited ancient as well as modern implements. These exhibits are proving to be of great value to the prospective purchasers, who come there to study the various kinds of implements. In this way they are able to decide what machines will best serve the requirements of their own community.

It was with a view of providing a link between the agricultural engineer and the farmer that the French instituted its machine-testing station near Paris, which is probably the most thoroughly equipped in the world for the scientific study of the principles of construction and efficiency in operation of farm implements and machinery. The study of agriculture in France has been so systematized and the whole country so mapped out that the possibilities and requirements of every district can be readily ascertained whenever there is a question of introducing improvements. Knowing exactly the requirements, the men in charge are able to report upon the suitability of any mechanism presented to them, and even to offer suggestions, as well as give unbiased reports upon their value for French agriculture. So good are the results which have been thus obtained that the practice is being followed in Spain, where has recently been established a machinery trial station upon the same lines. A similar department has been created by the Minister of Commerce and Industry in the Netherlands, where agricultural engineers are given facilities for having their mechanism officially tested at the Agricultural Academy of Wageningen.

It is, however, to Germany that the greatest credit is due for extensive trials of farm machinery, made under the auspices of the German Agricultural Society. This society was organized in 1885. The first implement exhibits and field trials were conducted in 1887, and have been held annually since that time.

These are competitive field trials, conducted by a chosen committee of judges who are paid a per diem for the time employed. Prizes, medals and diplomas are presented to successful competitors. The expenses of the trials are borne partly by the manufacturers who

enter the contest and partly by the Agricultural Society, which has a very large membership. The results of the trials are presented in the year-book published by the society.

Since 1892 the society has established a special annual exhibit for new inventions of agricultural machinery, for the purpose of permitting purchasers to make comparisons and to study new improvements and innovations. Only such machines can appear in this exhibit as have been patented within the previous twenty-four months; or in case no patent has been sought, have been in use not more than twelve months previous to the time of the exhibit.

The experiments conducted by the Agricultural Society have been very extensive and have included trials with electric motive power for farm purposes, steam plows and cultivators, the various kinds of dairy machinery, and equipments used for the manufacture of alcohol from farm products.

Since 1902 they have accomplished splendid results in encouraging the invention and manufacture of motors, lamps and cooking apparatus, which denaturized alcohol. Through this means the somewhat depressed agricultural conditions in Germany have been revived, as new and profitable sources for utilizing the raw materials of the farm have been found.

Besides this there have been established in several of the provinces of Germany, in connection with the agricultural colleges, implement experiment stations, to which manufacturers can send their machines and have them tested for accuracy of work, strength and durability. From the reports and suggestions offered by the committee in charge of these tests, the manufacturers may draw conclusions as to the success their machines may have with the farmers, and also possible lines of improvement. The results of these tests may or may not be published. If a test should prove that the machines are not satisfactory, the manufacturers may request that the results of the test be withheld from publication. The Agricultural High School at Berlin has a well developed and efficient department of farm machinery, with perhaps the most extensive museum of models in the world. A very complete equipment for the detailed scientific study of principles of construction and operation is now being installed. In the opinion of the head of that department, nothing has done more to improve the agricultural methods in Germany than the study by the young men of the tools of their own and other countries, and out of it have resulted many improvements in construction.

In our own country conditions are somewhat different from those in any of the foreign countries mentioned. There is more need of farm implement testing in Europe than in America, because manufacturers are not so far advanced and the farmers are less disposed than the American farmers to use improved machinery and implements. The major part of the European tests in the past have been demonstrations in order to interest the farmers, but now the experiments are made more scientific, for the benefit of manufacturers. With our numerous implement factories and their enormous annual output, there is no need of encouragement in manufacture.

It is, perhaps, not advisable to conduct competitive field trials between various makes of machines and to offer prizes for such trials. The method adopted in foreign countries, of publishing in their reports the

names of the machines tested, is also open to debate as far as this country is concerned, in view of the unfair advantage that might be taken of such methods of advertising. There is still a wide field of usefulness open to the agricultural experiment stations and the Federal Government, by which they are able to substantially aid both the farmers and implement manufacturers by their farm machinery investigation.

Only in recent years have the agricultural colleges recognized the importance of giving instructions to their students in the construction, care and operation of farm implements. At the present time numerous colleges are about to establish courses in Farm Mechanics.

I have found by experience that instruction in farm machinery can not be obtained by reading text-books, but the students must have actual practice in erecting, adjusting and operating the machines, before they understand the principles of construction. In order that the students may judge of the merits of implements, they must have practice in testing them and make comparisons. For this reason the well planned farm mechanic courses give considerable time to research work, in which the students, under the direction of the instructor, experiment with the farm tools and learn their merits and defects. Notwithstanding the large amount of farm machinery manufactured in this country, there is very little reliable information available for the students and farmers who wish to become posted on the machines. This is another reason why the agricultural colleges should conduct investigations and collect information on the subject.

The farmers of the country have become accustomed to writing to the agricultural colleges and the Depart-

ment of Agriculture for information on any subject in which they are interested. In order that the questions asked on farm machinery may be answered intelligently, it is necessary for the men in charge of the work to investigate the merits of the machine and to learn by actual experiments just what the farmer should expect the machine to accomplish. The information published by the experiment stations on other agricultural subjects is eagerly sought for by the farmers, and there is no reason why information on agricultural machinery should not prove to be of equally great value to them as it has proved to be to the farmers of Europe.

From the manufacturers' standpoint, there is no way in which he can better advertise his goods than to co-operate with the agricultural colleges in order that the progressive future farmers may become familiar with the machines. It is also quite advisable for manufacturers, when they are making any marked changes in the construction of their machines or introducing new machines, to have them thoroughly tested by competent and disinterested men at the agricultural experiment stations, who know the agricultural requirements and are able to inform the manufacturers if the implements are able to satisfactorily meet these requirements.

(To be continued.)

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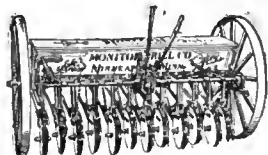
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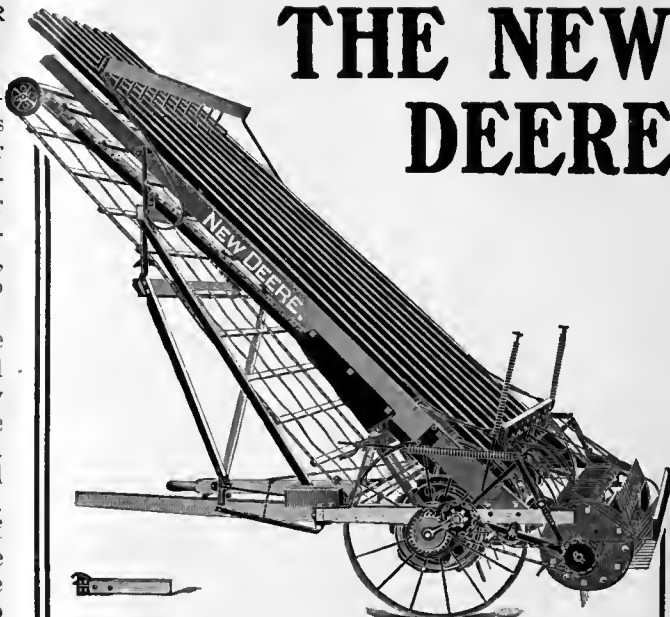
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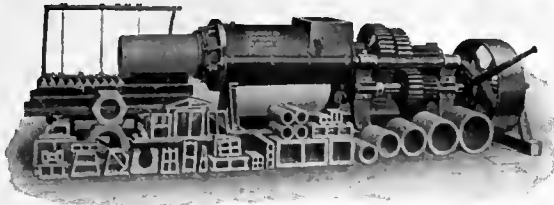
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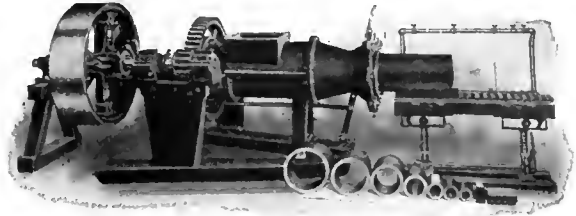
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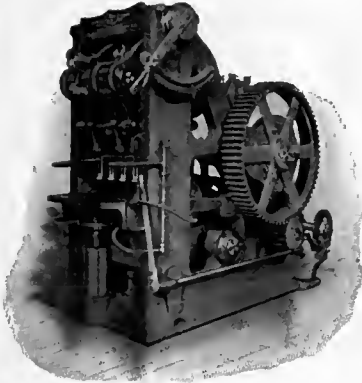
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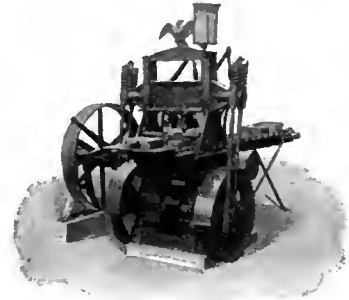
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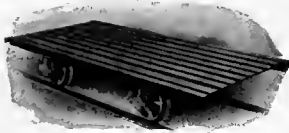
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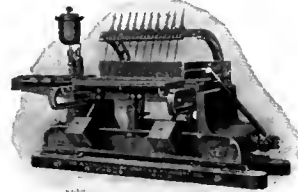
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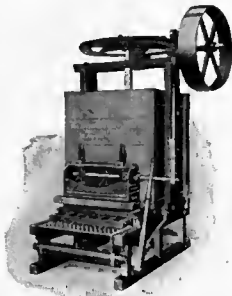
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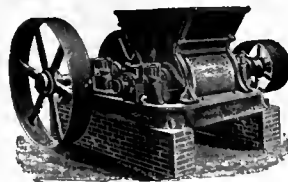
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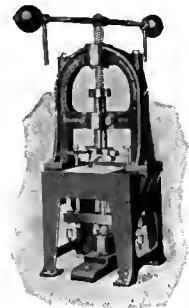
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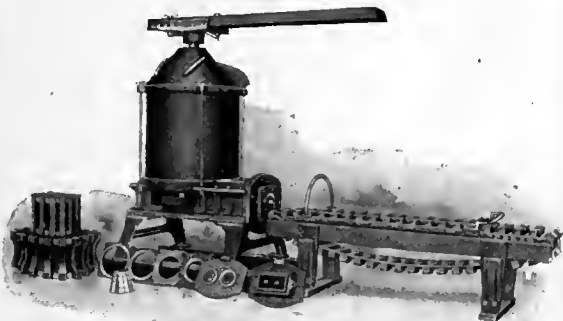
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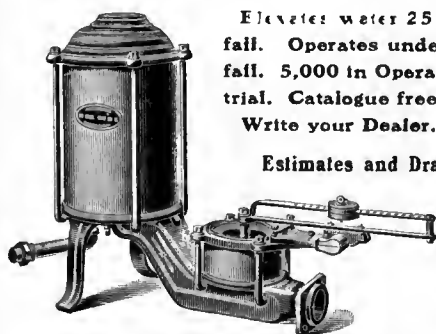
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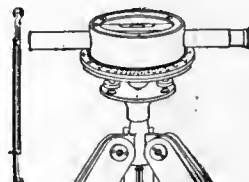
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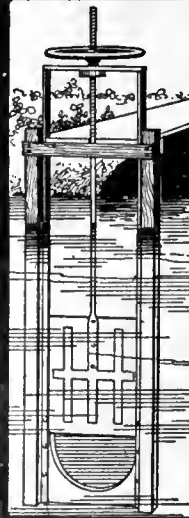
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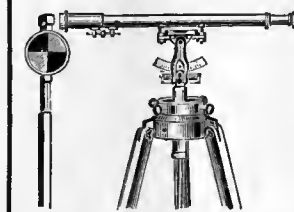
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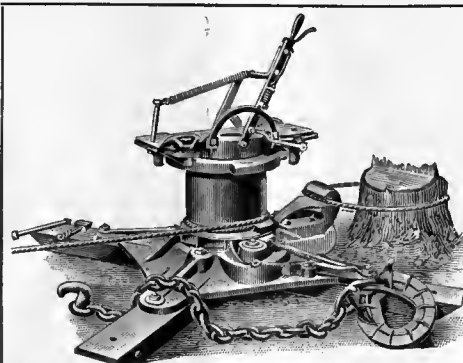


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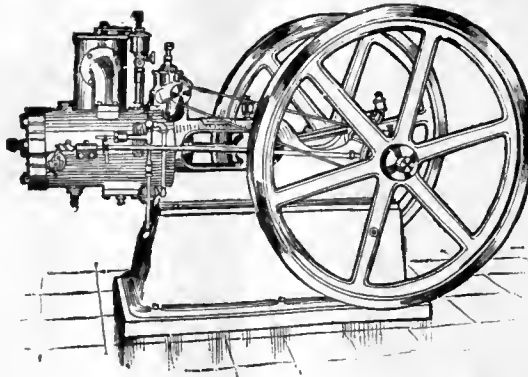
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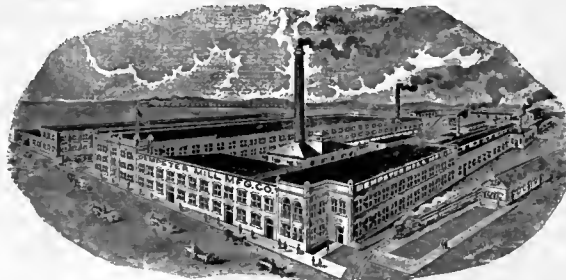
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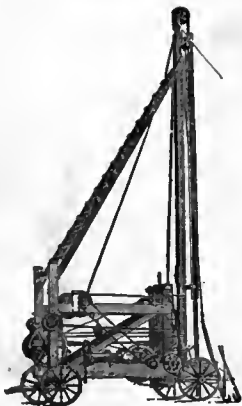
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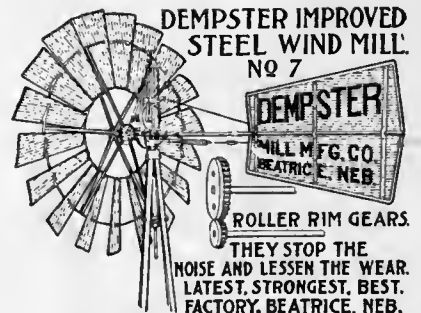
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VOL. XXI.

CHICAGO JUNE 1 1906.

NO 8.

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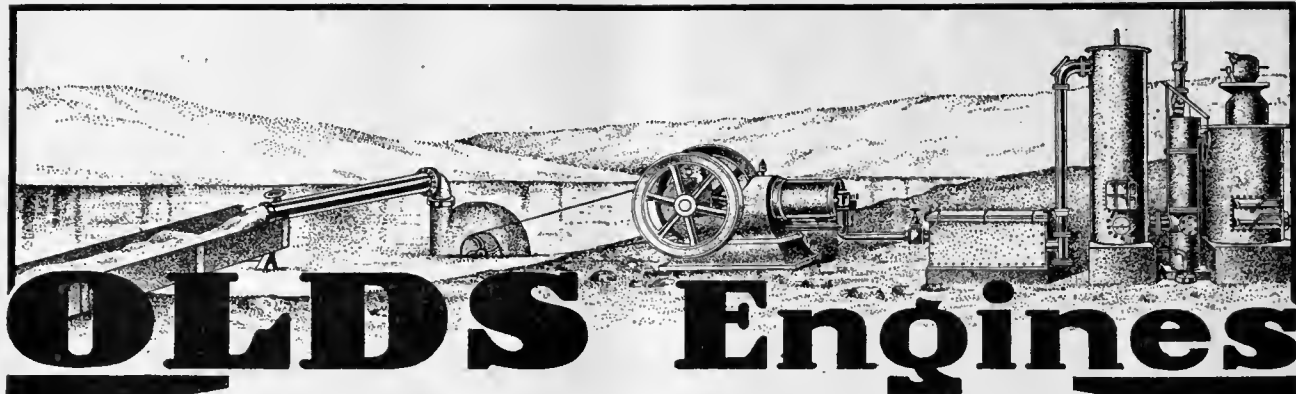
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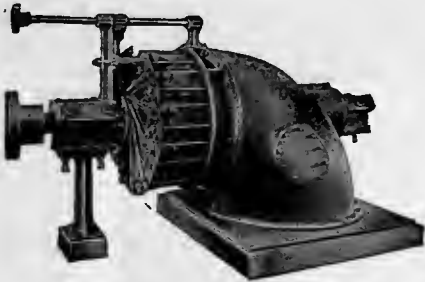
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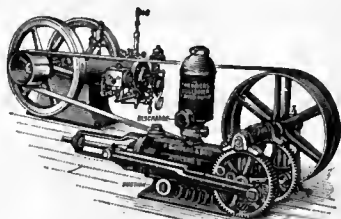
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MYERS POWER PUMPS

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GAS ENGINE

FIG. 952

HORIZONTAL BULLDOZERS, 3' to 6' CYLINDERS

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BACK GEARED
WORKING HEAD

TAPPED FOR
3" PIPE

5, 7½ and 10"
STROKE

FOR
BELT, WIND OR
HAND POWER

FIG. 1113

2½" DISCHARGE



BULLDOZER
WORKING
HEAD

1½" BRASS ROD

PIPE FLANGE

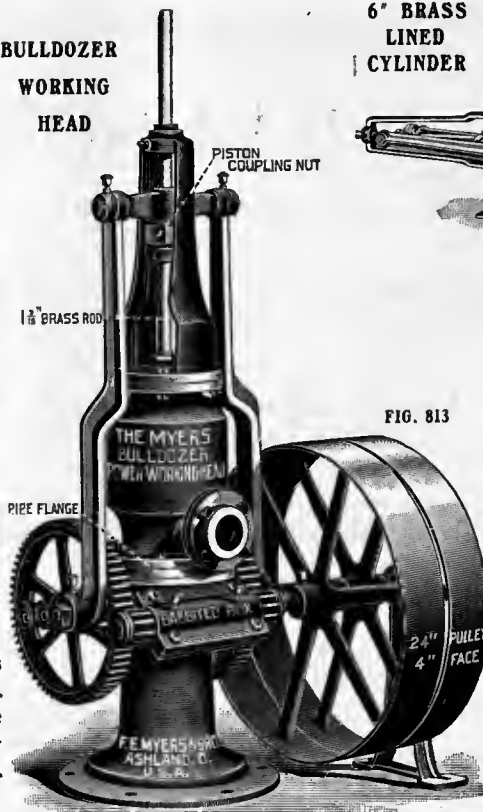
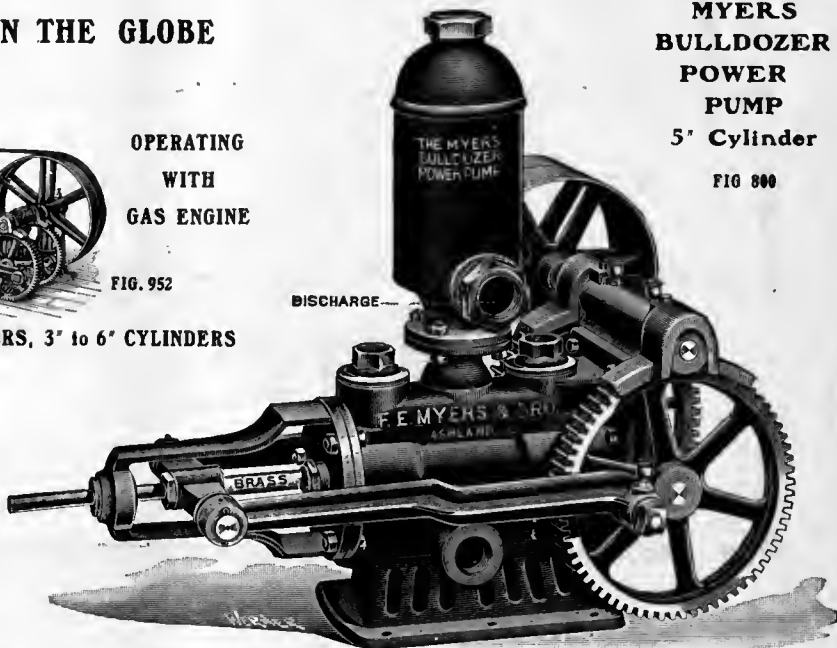


FIG. 813

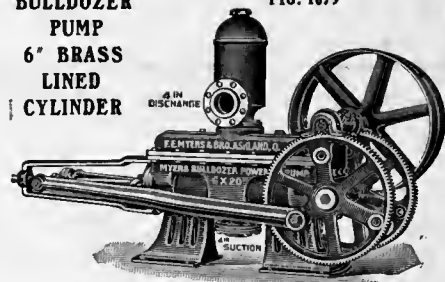
MYERS
BULLDOZER
POWER
PUMP
5' Cylinder

FIG. 800



BULLDOZER
PUMP
6" BRASS
LINED
CYLINDER

FIG. 1079



MYERS BULLDOZER
WORKING HEADS

No. 359

5', 7½', 10' STROKE
DISCHARGE, 2½ or 3 INCHES
SUCTION 2 to 4 INCHES

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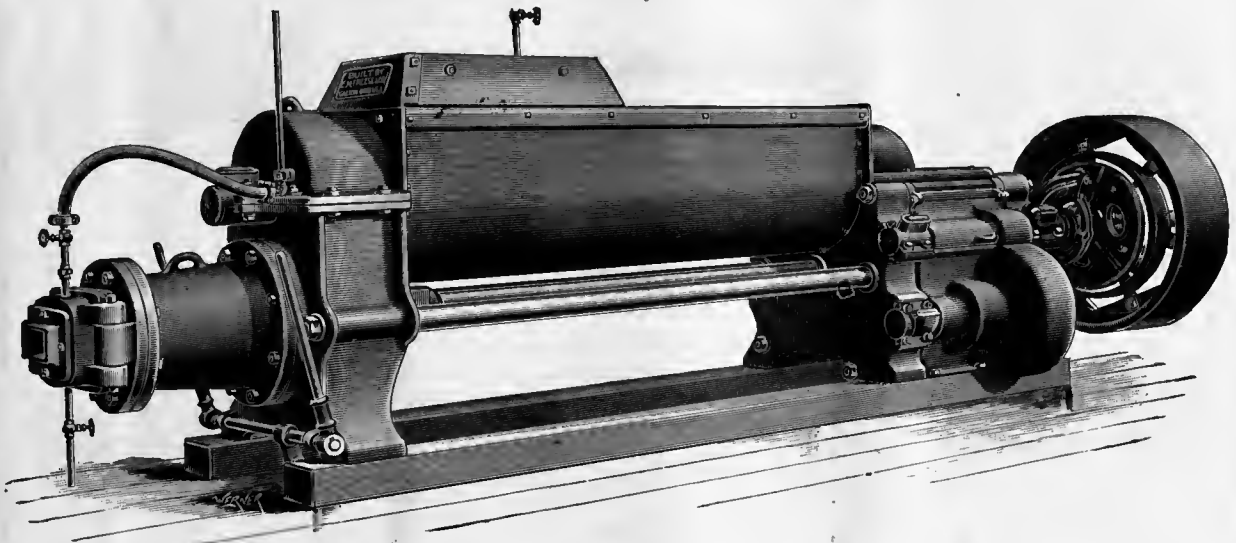
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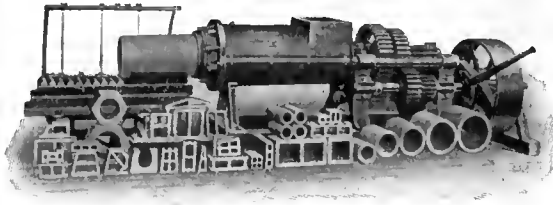


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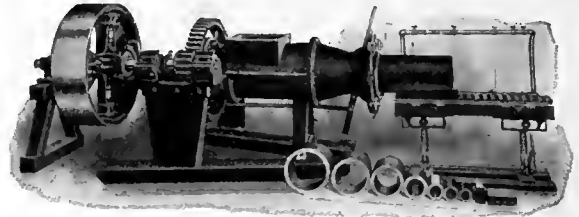
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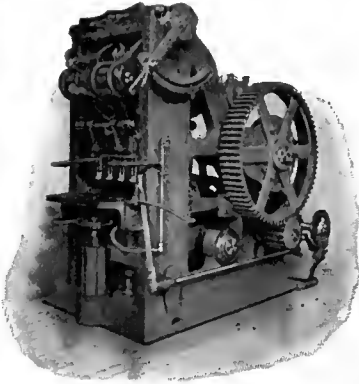
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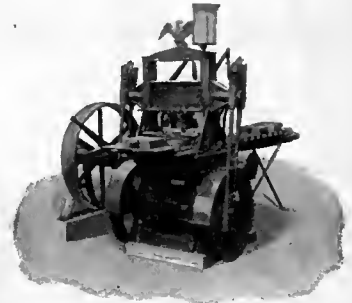
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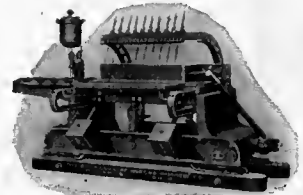
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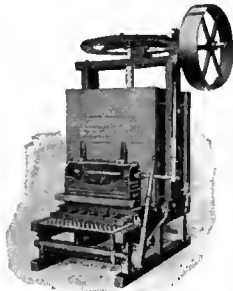
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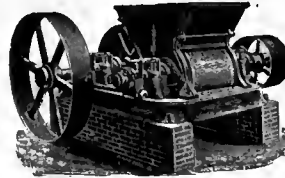
The American Clay
Mch. Co...Bucyrus, Ohio



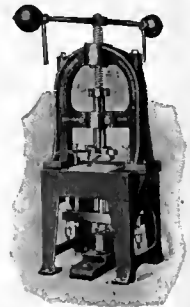
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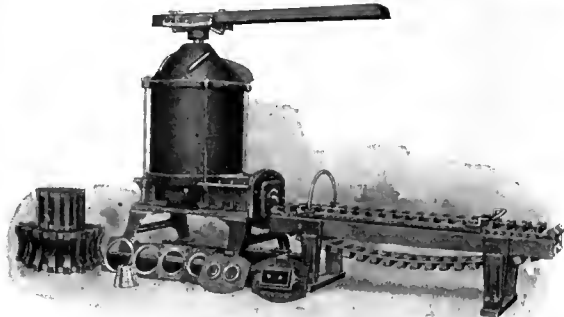
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THE IRRIGATION AGE

VOL. XXI

CHICAGO, JUNE, 1906.

No. 8

THE IRRIGATION AGE

With which is Merged

MODERN IRRIGATION
THE IRRIGATION ERA
ARID AMERICA

THE DRAINAGE JOURNAL
MID-WEST
THE FARM HERALD

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ANNOUNCEMENT.

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It may interest advertisers to know that *The Irrigation Age* is the only publication in the world having an actual paid in advance circulation among individual irrigators and large irrigation corporations. It is read regularly by all interested in this subject and has readers in all parts of the world. *The Irrigation Age* is 21 years old and is the pioneer publication of its class in the world.

New Assistant.

Mr. A. P. Anderson, a graduate of the Washington State College in the course of Civil Engineering, and who has been in the service of the United States Geological Survey in the past years, has been engaged by the Montana Agricultural College and Experiment Station as an assistant in civil engineering and assistant experiment station engineer. Mr. Anderson will arrive at Bozeman June 1.

National Association Report.

We are publishing in this issue a report presented and adopted by the National Association of Manufacturers at their annual meeting held in New York, May 15th.

This report was prepared and forwarded to us by Mr. L. M. Byles, Chairman of the Committee on Irrigation of that organization. Owing to the late hour at which the report reached us, it is impossible to discuss any of its special features; and we are publishing it in complete form and will reserve comment for future issues of *THE IRRIGATION AGE*. One feature concerning this report which forcibly impresses us is the fact that so large and strong an organization as the National Association of Manufacturers is taking an active interest in all irrigation development work throughout the Western country. We feel that this is a good sign, and that the association is to be complimented on having appointed a committee who have gone into the matter in such

an exhaustive manner. A hurried glance over this report reveals a peculiar stand taken on the matter of leasing public lands, which will be discussed more extensively in our June issue.

The Montana Experiment Station has commenced a series of investigations on the ground and seepage waters of the State, with a view of bettering some of the conditions which are making so much trouble and expense throughout the irrigated portions of Montana. Upon the Experiment Station farm is a considerable tract which has been too wet for pasture land. This land it is proposed to drain by a somewhat novel system, making use of the waters from same to irrigate other portions of the farm. Machinery for a pumping plant has been ordered and the work of installing has already commenced. Some of the farmers in the valley who have similar conditions have investigated the plans of the engineer and have had sufficient confidence in the outcome of the plan to not await results, but have commenced to develop their own and similar lands.

Drainage investigations will be carried on by the Station in the Yellowstone Valley this year, where considerable tracts of land have been almost ruined from seepage causes alone. Attempts to drain the valley lands has met thus far with indifferent success. This valley is underlaid at a slight depth with quicksand, which makes the usual methods of drainage both expensive and unsatisfactory.

**Five
Thousand
Implement
Dealers.**

The publishers wish to call the attention of manufacturers and others to the new cover design, and in this connection announce that plans which have been under way for the past six months are being brought to fruition by the addition to our list of the names of over two thousand implement dealers and general store keepers. These firms are all located in the irrigated sections of the West, and all of them are intensely interested in everything pertaining to that art, not only what is produced by this system of farming but in all machinery used in that connection. For this reason each and all of them should become good buyers of all classes of machinery advertised in these columns. They, moreover, should find it advantageous to correspond with manufacturers of farm implements and thereby offer such suggestions from time to time as may be of benefit to makers of farm tools who are not acquainted with the needs of different localities.

Arrangements have been completed whereby thirty subscription agents will visit different irrigated districts, and it is intended to keep them in the field during the balance of this year, with a view to secure five thousand paid subscribers among this class. It is our intention to keep our readers fully informed about the progress of this work, and careful advertisers may readily see that with a list of five thousand buyers among dealers, we will be able to offer a better field than that presented by any other publication which reaches this class. Five thousand dealers west of the 100th meridian will give us double the number reached by any other publication in the dealers' class.

**Supports
Reclamation
Bureau.**

In discussing the matter of criticism of the Reclamation Bureau, and its treatment of those interested in private irrigation projects, we have received many communications from both sides, and among others received recently, we quote herewith from a letter written by a gentleman connected with the Reclamation Bureau, which is cleanly worded. The writer is a gentleman whom we know to be eminently fair insofar as his knowledge extends. It is thought better to quote herewith at length: "The more I consider your letter the more I am convinced that were you to give the same study to the rules and regulations governing the Reclamation Service and its connection with the Interior Department that you do to the stories of promoters who allege unjust treatment, you would in some degree temper your criticism. I honestly believe that it is the intent of the engineers of the Reclamation Service to deal fairly and conscientiously with everybody. They are not seeking trouble, and the fact that up to date we have not had

to resort to condemnation to acquire any man's property should convince you that no undue pressure is being brought to bear upon private interests.

"I believe you aim to be fair, and therefore I ask you not to lend ear solely to the promoters who complain, but to inform yourself fully by consulting with the people who are soliciting the Reclamation Service to build these works. It is human nature to seek as much as possible for our property, and it is rare indeed when the Government is the purchaser that an unfair price is not set upon the property desired. The people who must pay, however, are entitled to have a say in the matter of price paid for any property acquired. I am not at all familiar with the Ludy case you mention, yet I venture to say if you will investigate it fully you will find that it has two sides and that the engineers are not acting improperly.

"Really, Mr. Anderson, all of these matters belong with the Secretary, who passes on all of them finally and in accordance with the law. One thing you overlook is that the Government does not do business like an individual. It were better in some cases if it did, I grant you, but precedent and regulation rule in departmental matters, and we are constrained to act in accordance therewith. I am confident that these troubles and annoyances which you mention are only incidental and that with time and experience most of them will be eliminated. It is a pretty big task which confronts us; we realize it, and we bespeak the co-operation of every one who is interested in the up-building of our Western empire."

THE IRRIGATION AGE is willing at all times to publish both sides of a controversy arising from the differences of opinion between the people who are promoting private enterprises, and Government officials who have charge of the expenditure of large sums of money made available under the Reclamation law.

The columns of this journal are open to both sides whenever they choose to exploit their views, whether it be in the form of criticism or commendation.

**Sinelnikoff
Offers
Suggestions.**

The attention of our readers is called to the communication in this issue from Mr. Nicholas Sinelnikoff, Agricultural Engineer, representing the Agricultural Department of Russia, in this country at the present time. Mr. Sinelnikoff has made a general tour of the Western country, and has studied irrigation conditions so that he may be able to compare the possibilities of his country, and its development in an agricultural way under irrigation, with what has been accomplished in Western America.

Last year this gentleman visited a great many points along the line of the Northern Pacific Railroad, where irrigation projects are established; attended the

Irrigation Congress at Portland, Oregon, and subsequently visited in company with officials of the Reclamation Bureau, a number of government projects in Nevada, Idaho, and elsewhere.

The Agricultural Department of the Russian government made a wise selection when it was decided to send Mr. Sinelnikoff to this country. He is a student of an investigating turn, an affable gentleman, and ready and willing at all times to exchange knowledge and conditions in his country for information concerning similar development in America. All who have met Mr. Sinelnikoff speak very highly of his ability and the wonderful aptness which he has displayed in mastering the English language, and grasping our local conditions.

In the communication referred to, Mr. Sinelnikoff suggests the mutual study of agricultural conditions in Russia and the United States, and states that he believes it will be advantageous to both countries to co-operate in the establishment of an understanding between these two great nations of their natural wealth and the needs of each which may possibly be supplied one to the other, where local conditions preclude the possibility of the need being supplied by home manufacture.

Mr. Sinelnikoff speaks particularly of the general use of American made reaping and mowing machines in his country, and among other things he states: "It may be said, in short, that the complicated American agricultural machinery has penetrated into those regions of Asia where Russian civilization and culture exist"; and again in reference to European Russia he states, "We notice that during the latter years American cultivators and many other agricultural implements of American manufacture, have found wide adaptation on sugar beet plantations." He speaks furthermore of the possible development of a large trade in that country in the near future for gas, and gasoline engines, and pumping machinery manufactured in this country.

He says, also, that the American methods of construction of irrigation works, and the various kinds of co-operation may be successfully utilized in Russia. In a personal letter received from Mr. Sinelnikoff, he suggests a plan which may be of benefit to American manufacturers, as well as people of Russia, in the form of a bureau, one branch of which could be located in Chicago, and another in Moscow, the purpose of which would be to obtain and exchange information regarding agricultural questions; and going further, he says: "Each bureau might consist of two sections—one for experimental work and the other for irrigation work in general, and the supply of machinery for agricultural purposes. The lack of information with regard to the latter is greatly felt in Russia, as American manufacturers have few agents

in that country, and on account of the distance inquiries sent to America are frequently delayed and through ignorance of the language such correspondence is very difficult." Continuing Mr. Sinelnikoff states that the bureau might be organized in Moscow "in connection with the agricultural journals or agricultural societies." He also thinks that American manufacturers would probably be willing to defray the financial expense of the organization, as it would facilitate the sale of their products in Russia, especially on account of the diminution of duty on American machinery.

This move, it seems to us, would prove a timely measure. Mr. Sinelnikoff states that he has recently been asked both by Russian and American machinery manufacturers, about mutual agricultural conditions, but refrained from entering into the matter, as it would assist only single cases, and would have no influence upon the stability of relations, while such an organization as that suggested above would be a permanent institution of ever increasing value.

He thinks that "the opinions of the heads of the different bureaus in Washington should be secured, likewise those of all interested in such a movement." In conclusion Mr. Sinelnikoff says: "An organization formed solely with the view of the sale of American machinery would not meet with the same success as one in connection with agricultural experimental work, because many persons, as zemstvo agronomists, and directors of agricultural stations who would be useful in the introduction of American machinery in Russia, would join more willingly an organization of this character if it had in its program the exchange of experiments.

"Russian foresters would likewise be interested in such an organization, as many American species of timber grow successfully in the steppes of Southern Russia."

In conclusion would it not be well for some of our manufacturers who are looking for trade in that country to get in touch with Mr. Sinelnikoff, and learn more fully his views?

THE IRRIGATION AGE is of the opinion that an opportunity is here offered for the extension of trade in American goods in that country. We would suggest that those interested correspond with Mr. Sinelnikoff at his present address—1635 P Street, N. W., Washington, D. C. We are presenting in this issue a very good likeness of this gentleman.

Will pay for the IRRIGATION AGE
\$2.50 one year and the PRIMER OF
IRRIGATION.

EDITORIAL NOTES.

PRESIDENT ROOSEVELT states in his address on the man with the muck rake, "If the whole picture is painted black, there remains no hue whereby to single out the rascals for distinction from their fellows." Generalizations which are so frequently indulged in land fraud charges will make immune real thieves.

MORBID picturings of scribes and Pharisees are bad enough, but too many good citizens are being haled before federal courts, and rendered objects of suspicion by secret governmental process, to hope for any possible conviction without the serious menace of mal-administration of justice.

ONE of two alternatives seem apparent: wholesale indictments will clear the really guilty parties, or subordinates in the federal service are building reputations at the expense of honest men. It seems incredible that some citizens of our acquaintance, men with untarnished reputations, should suffer irreparable injury to help the reputation of an aspiring prosecutor of the government.

PUBLISHED interviews and current events compel opinion that over-zealous and over-ambitious attaches of the Interior Department are not discriminating in their judgment, and care not for the innocence or guilt of parties accused, so long as it will give them publicity. It is the fascinating allurements of the limelight for that moth-brained contingent which by hook or crook finds its way into the service.

ATTORNEY FRANCIS J. HENEY is quoted in an interview as saying that he "hopes to land" Senator Herrmann of Oregon. He made no qualification of the statement, no proviso "if the Senator is guilty." If he can "land" him, guilty or not guilty, the reputation of Heney is made. If by a tissue of falsehood, or sworn circumstantial evidence, he can fasten a stigma to an honorable name, if political enemies can aid in burying Bingham Herrmann, it will serve as well as fact to aid the aspiring prosecutor up the ladder of fame.

SENATOR HERRMANN may be guilty of all he is charged, and more, for aught we know, but that is a matter of fact and evidence, and not of hope and opinion. By this expressed attitude toward the accused, Attorney Heney has made manifest an attribute of character that needs repression, and *declared himself incompetent to represent a government toward a citizen of the government.*

Send \$2.50 for The Irrigation Age one year and The Primer of Irrigation, 300 page book.

MR. DEFRESE, a special agent of the Land Department, has a \$1,000 damage suit against him, because of an erroneous report upon the homestead of a citizen of Nebraska. When served with papers he intimated an immunity because of federal work, which leads to the question: "Does the government spread a mantle of protection over malefactors in charmed circles of its employment?"

WHOLESALE reports displaying an astonishing lack of accurate information is making the presumed vigilance of the Land Department a howling farce. People are becoming weary of petty annoyance and persecution and are seeking means of redress and reimbursement for injuries inflicted in the name of the law, and there is likely to be a multiplicity of suits like that against Mr. DeFreese.

THE manifest and almost universal favor with which news of this suit was greeted by local press and the people, upon homesteads, indicates a public sentiment to be deplored. Antagonism between the government and settlers upon public domain does not augur well or encourage home-building—a condition most melancholy. It has made the homestead less desirable and added materially to values of deeded properties, where dominance, or arrogance, or ignorance, or incompetence, or ambition of special agents availeth not.

IT is time to call a halt. It is time to invoke a higher order of government procedure. Encourage, not discourage settlement. Citizens of the republic are entitled to its protection. Prosecutors should hope that the accused may prove his innocence, but get all possible evidence leading to a just conclusion.

SECRETARY HITCHCOCK's recent order making a reserve adjoining Lake Alice in Western Nebraska for "park, experimental and demonstration purposes," can be made a most propitious initiation for beneficent result. The agricultural Department and Reclamation Service are to co-operate, and our horoscope includes a brighter future for semi-arid areas. Intelligent experiments along lines of range culture, and improvement by introduction of new forage plants, will make the range yield vastly increased pasturage, and consequently more and better homes will eventually find lodgment nestled among the hills.

CERTAIN specialized adjuncts of press lately have contained "trade marked" editorials and "news" items complimentary to the Reclamation Service business efficiency. What was the necessity which inspired the reclamation press bureau? It is possible that good management now needs constant self-commendatory advertising.

AT THE recent exercises opening the Interstate Canal, the only note of discord was the braggadocio of Engineer Field. There has been rapid and good work, which we commend, but the business detail has been found wanting. First, two over-lapping contracts. Being unable to readjust this with damages because of the attitude of Mr. Lingle's backers, extensive bonus—ten to twelve per cent increase—was paid construction contractors. Now, it appears all contractors, *save one*, completed their work in time to secure the bonus. But that one holds the key to watering nineteen thousand of the twenty thousand acres agreed to be supplied with water this year.

THIS means another milking, for damages. In all, Mr. Lingle has fared and will fare well. He was eighteen months ago upon the rack. He risked a final plunge by telling Mr. Field that H. G. Leavitt was trying to buy him out, and Field rose to the hook. Since then fortune and favor have been with Lingle. Today he is automobiling around the world on money received from the government which water users will have to pay back.

How to initiate reforms—can anyone suggest a plan that will prove best? Two years ago Thomas W. Lawson heralded to the world that he had a remedy for financial ills. Thousands of students have plowed through mazes of financial crimes and indulged the luxury of lessons in high finance. Yet because there is much alleged idiocy at large his remedy is a hope deferred, and by its delay he has emphasized the charges of his enemies that he is a charlatan.

A YEAR ago we saw the need of improved business methods in the Reclamation Service. We saw a remedy. In charity for engineers we offered the remedy as relief. Dr. Newell scorned the necessity, and immediately forthwith underground evidence (?) of the undesirable character, and various other personal attainments of the scribe, found lodgment in the rogues' gallery of the department.

THUS our puzzling conjecture. The man who defers the remedy long, the man who defies the money mills, is a scallawag. And the man who proposes his remedy at once, if it proposes improved governmental efficiency, has his character and purposes secretly assassinated, and is accused of opposing federal work.

\$2.50 will secure for you one year's subscription to THE IRRIGATION AGE and a finely bound volume of the Primer of Irrigation which will be sent postpaid in a few months, when volume is completed. The Primer of Irrigation will be finely illustrated and will contain about 300 pages. Send post office or express money order for \$2.50 and secure copy of first edition.

NICHOLAS SINELNIKOFF, AGRICULTURAL ENGINEER, OF RUSSIA, WRITES HIS IMPRESSIONS.

Editor IRRIGATION AGE, Chicago, Ill.:

Dear Sir:—In compliance with your suggestion to give my impressions on America during my travels across this continent, I am glad to express my opinion on irrigation and, in general, works of an agricultural character.

After having studied irrigation in Europe, I proposed to stay not over four months in the United States. It is, however, nearly a year since I began investigating this work here—so interesting and instructive have I found it. I was especially struck by the energy and capacity, inherent to the Americans, to organize and systematically utilize to the utmost the natural wealth of the country, taking advantage of the experience gleaned by humanity. It is sufficient to mention the success achieved in agricultural experimental work and



Nicholas Sinelnikoff, Agricultural Engineer.
Special Representative in U. S. of the Agricultural Department
of the Russian Government.

the development of irrigation for the last decade. The similarity of certain regions of Russia and of the United States offers the possibility of borrowing one from the other methods of culture as well as various kinds of cereals and plants. Thus, for example, Russian macaroni wheats are successfully grown in the United States, as are also the Russian mulberry, several kinds of fruit trees, Turkestan alfalfa, etc. In artificial silviculture some of the American species of timber grow better in the steppes of southern Russia than the same kinds taken from Central Russia. The similarity of conditions allows likewise the adaptation in Russia of agricultural machinery of American construction. A few years ago I traveled over Siberia from the River Obi and the Altai Mountains to Central Asia and the Ural Mountains—several thousands of miles. American reaping and mowing machines have already been adopted even in those distant regions. They are har-

nessed, according to the locality to camels, oxen, or horses of the steppe. It may be said, in short, that the complicated American agricultural machinery has penetrated into those regions of Asia where Russian civilization and culture exist. If we refer to European Russia, we notice that during the later years American cultivators, not mentioning many other agricultural implements, have found wide adaptation on sugar beet plantations. Another kind of machine of American construction, will, in the near future, find a ready market in Russia—these are gasoline engines and pumping machinery, especially in Trans-Caucasus, where the abundance of naphtha, the richness of the soil, the small cost of labor, favor the adoption of these machines for the supply of water to the canals and the development of irrigation. The American methods of construction of irrigation works and the various kinds of co-operations may be successfully utilized in Russia.

These examples suffice to illustrate that the mutual study of agricultural conditions in Russia and in the United States is advantageous to both countries and will co-operate in the establishment of an understanding between two great nations in the fuller utilization of their natural wealth for the benefit of man.

At the same time, I take pleasure in expressing my sincere thanks to all those who have tendered me such courteous assistance in my investigation of irrigation works in America.

Should there ever be organized in the United States a society whose aim would be the study of agricultural conditions in Russia and in the United States for the purpose of exchanging experiences gleaned in agricultural work in general, in view of the similarity of certain regions in the two countries, I would think that many a Russian would gladly join this association.

Yours very truly,

NICHOLAS SINELNIOFF,
Agricultural Engineer.

CONTROL OF GRAZING ON THE PUBLIC LANDS.

Successful Permit System Now in Force on Reserve Ranges Improves Pasturage and Insures Stability of Live-Stock Industry.

The following is sent out for publication by the Forest Service, United States Department of Agriculture:

Now that the Government grazing policy is in successful operation on the National forest reserves, the question has arisen whether the same or some similar policy might not be applied to the open public range.

The policy of the Forest Service is not to hold the reserves out of use, but to secure their fullest and most permanent use. To this end, grazing under proper restrictions is permitted. Happily, these restrictions have thus far met with general approval.

From the first, the importance of fitting the regulations to local conditions has been recognized. Rules occasioning needless hardship to stockmen have been modified, and emergencies demanding instant action have been promptly met.

When a new reserve has been proclaimed all stock grazing upon it is allowed to remain during the first year; if, afterward, this number is found to be too great for the resources of the range, it is gradually re-

duced. Stockmen are aided in effecting a satisfactory distribution of their stock upon the range and in securing from it the most profitable and permanent use. Small stock owners living in the vicinity of the reserves are given such preference in the allotment of grazing privileges as will protect their interests. First occupants of the range and farmers are also preferred. The rights of large owners based upon the range custom of the past are recognized, and reductions in the number of their stock are required only when necessary to protect the range of the grazing rights of bona fide settlers.

Necessary range divisions between owners of different kinds of stock are made, and controversy between sheepmen and cattlemen is promptly ended. Where necessary, the construction of drift or division fences is also allowed, provided the area fenced is not greater than the needs of the stock owner.

Outside the forest reserves, however, is an area of public land, estimated at 400,000,000 acres, which has no present value except for grazing purposes. On this land grazing is wholly unrestrained by law. Commercial interests, great and small, have competed for its use, and the result has been abuse of the range. Millions of acres have been recklessly overgrazed and practically ruined. In his last annual message, the President says: "It is probable that the present grazing value of the open public range is scarcely more than half what it once was, or what it might easily be again under careful regulation." Some stockmen have, to the exclusion of others, possessed themselves of the strategic positions—that is, the lands controlling the streams, springs, and other watering places, and by this means have secured temporary control of the adjoining grazing lands. Charges of fraudulent entry have led to litigation. Great areas have been illegally fenced. Again, stock owners, notably sheep and cattle men, have defended their conflicting claims by force of arms, causing serious loss of property and even of life.

Obviously such conditions should be corrected by law. The remedy would seem to be to apply to the open public range the regulations already governing the forest reserves. This conclusion is strengthened not only by the success attending the forest-reserve policy, but also by the effect of fencing the public grazing lands. Though illegal, this fencing has in most cases greatly improved the condition of the area inclosed. Care, however, must be taken to avoid the application of sweeping and ironclad regulations to an area so vast and to conditions so different. The investigations of the Public Lands Commission show that immediate application of any inflexible rule to all grazing lands alike, regardless of local conditions or grazing values, would be disastrous, and that improvement must be sought through the gradual introduction into each locality of such form of control as is specifically suited to it.

In his message, already referred to, the President says:

"The best use of the public grazing lands requires the careful examination and classification of these lands in order to give each settler land enough to support his family and no more. While this work is being done, and until the lands are settled, the Government should take control of the open range, under reasonable regulations suited to local needs, following the general policy already in successful operation on the forest reserves."

Should the policy thus suggested be established by law great good would undoubtedly result.

OPENING INTERSTATE CANAL, NEBRASKA-WYOMING.

Saturday, May 5th, witnessed the ceremonies opening the headgates of the Interstate Canal. This is looked upon as one of the propitious events in the history of the North Platte Valley. Despite errors or mismanagement it is sure to take water that now runs to waste and make hundreds of thousands of dollars annual product.

Several hundred citizens from the villages and country up and down the valley congregated to commemorate the occasion. Addresses were made by John Powers, president North Platte Valley Water Users' Association, S. D. Cox, secretary of the association, G. L. Shumway, executive chairman American Irrigation Federation, A. B. Wood, Senator Stewart (of Nebraska), Mr. Jillson, of Providence, R. I., and Engineers F. E. Wells and J. E. Field.

A very pretty feature of the ceremonies found its inception in the mind of M. E. Getter. The subjects of "Flowers," by G. L. Shumway, "Fruit," by Mr. Jillson, and "Product," by Senator Stewart, were accompanied by showers of blossoms, fruits and bread cast by Misses Johnson, Sanford and Stewart from huge cornucopias upon the inrushing waters. With sym-

IRRIGATION NOTES.

SPOKANE, WASH., May 22.—The Furnish ditch, which is to reclaim 20,000 acres of land in the western part of Umatilla County, Ore., has been opened and 10,000 acres already are supplied with water and as many more can be furnished. This land adjoins the land which will be watered by the Government's reclamation project in this county.

SPOKANE, WASH., May 22.—The Waha Land & Water Company has opened bids for the construction of twenty-two miles of ditch, three tunnels and two immense dams, the contract prices for which will aggregate about \$500,000. The work is a part of the big irrigation system which the water company will establish south of Lewiston, Idaho, to reclaim 20,000 acres of land. The work when completed will cost three times



Turning Water into the Inter-State Canal, Nebraska-Wyoming.

bols of the beauty and prosperity of future homes upon the areas to be reclaimed with due dedication to the god of Flora, and of fruit and field, with a horoscope of labyrinthian gardens, arbors, bowers and trellises, the waters sped upon their way.

By July forty miles of this main canal will be complete. By January fifty-five miles more will have been finished. And still another fifty miles must be constructed and a thousand miles of laterals, before the Interstate system is complete, and then less than a third of the whole plan of the Pathfinder project shall be done.

That will make one solid body of 500,000 acres of irrigated land in western Nebraska and eastern Wyoming, claimed by enthusiasts to be the largest contiguous irrigated area in the world.

Engineer Wells gave out the welcome information that the recent reported damage at the Pathfinder dam had been grossly exaggerated and would not exceed \$500. A first impression of Mr. Wells is good. He seems earnest and anxious for the success of the plan, and his work has had a handicap of error committed before he was made supervising engineer of the project. We are inclined to an opinion that a man like Mr. Wells would have eliminated some of the causes of criticism had he been in the shoes of Mr. Field or Morris Bein.

this initiation expenditure. The present work will irrigate about 8,000 acres and will be completed this year.

SPOKANE, WASH.—It is believed here that the approval by the secretary of the interior of the Tieton and Sunnyside irrigation project means a great and rapid development for the central portion of Washington, and many Spokane people will go to Benton and Yakima counties to be parties to this developing prosperity. Reclamation engineers say when the work of irrigation is started it means the reclamation of 400,000 acres of some of the finest soil in the world when supplied with water, and that \$10,000,000 will be expended in the coming ten years, beginning at once. In Benton County alone 200,000 acres will be irrigated.

\$2.50 will secure for you one year's subscription to THE IRRIGATION AGE and a finely bound volume of Primer of Irrigation which will be sent postpaid in a few months, when volume is completed. The Primer of Irrigation will be finely illustrated and will contain about 300 pages. Send post office or express money order for \$2.50 and secure copy of first edition.

LAND OF RIVERS, FRUITS AND GARDENS.

BY G. L. SHUMWAY.

The above is appropriate for the "Sunny San Juan," as it has been called by Judge Pendleton and others.

Cumbres Pass had forty feet of snow, Toltec Gorge was full of it. It covered San Luis Valley several feet deep, it buried Silverton and Creede, and Durango waded snow incumbered streets, while 50 to 150 miles away the lower valleys of the Animas, La Plata and San Juan rivers were bathed in their almost perpetual sunshine. This was in March, and orchards were in fine condition. Peaches and apricots almost in bloom, pomonas, pears and apples looking excellent. Heretofore fruit growers hauled these products fifty miles or more to railroad. Last year the Denver & Rio Grande built a standard gauge from Durango, which augers, we are told, that a standard gauge will supplant the narrow gauge scenic line from Alamosa, or the missing

and refuse to yield their interesting histories. Ancient cliff dwellings frown from Nature's battlements; and here Aztecs dwelt in innumerable thousands, and their ruined minarets, on lookouts overhang the turbid river. Here and there are traces of their old canals, and in the ruins are evidences of husbandry, including quantities of parched corn.

Glad smiles and "Wano, senior," everywhere spoke for the popularity of our guide. We visited Bloomfield and Hammond (Mormon settlements) and Blanco, Largo and Alcatraz (where Mexicans predominate) and ate and slept beneath hospitable Mexican roofs. The commodious domicile of Senor Archaleta contains a parlor of such unique and pleasing design that we each vowed that our next house should contain its counterpart. The farm of Don Archaleta, as does those of Don Juan Jaquez and Don Pachero, proves the productiveness which Mr. Turley proposes to enlarge by carrying the water to higher mesas, southward toward Lost Angels, El Huerfano, El Huerfanito and Pueblo Bonita.



Vista—Farmington, N. M.

link from Creede to Durango will be built, or a wide gauge line will come round the horn and down Canon Largo to unite at Farmington. The Southern Pacific has made some extensive surveys and purchased millions of dollars worth of coal lands in this vicinity, where 40-foot veins crop from the bluffs. It is believed they will extend a line to connect with the Kansas Pacific northeast of Pueblo which will make a short line to Los Angeles from Kansas City.

Legend and story have interwoven romance and poetic nomenclature, so that from the River of Pines to Shiprock Agency the "River wanders thro' the Gardens" of the imagination as well as literally.

Jay Turley, who stands six feet six and throws Mexican like a native, has laid out a life endeavor here which, accomplished, will reclaim 100,000 acres or more and leave to memory a lasting monument, and to unborn generations a heritage inconceivable. Mr. Turley was our escort on a journey over mesas of rare fertility, up a valley rich in possibilities, rich in its crude development, and rich in archeological interest.

Here ruined pueblos mark epochs of peace or tragedy, and dumb walls, builded centuries ago, stand silent

Westward, adown "Old Age River," or "Male River," as the Indians call it, stands Shiprocks, a famous intrusion that stands a thousand feet high, and Tsatekahn (where the mountain dips down to the water) marks the spot of another earlier convulsion.

Aztec is the county seat of San Juan County, but Farmington is the metropolis and the center of population and of extensive orchards. Strategic and topographic features emphasize the destiny of Farmington as the center of the "Land of Rivers, Fruits and Gardens." Situate centrally of the present development, and of probable future development, where the San Juan, Animas and La Plata rivers join, where Farmington Glade and Gallego Canon converge, where rich mesas surround it, where rough areas are adorned with pinon and cedar, where one year's peach crop from one and a half acres made \$2,200 to producer, where less than a half acre of grapes yielded \$500, and where many a more seemingly fantastic tale may truthfully be told.

Socially and intellectually, Farmington is all right in all that the word implies.

THE USES OF IRRIGATION.

W. R. GILBERT, MEDICINE HAT, ALBERTA, CANADA.

If it be true that a high place must be given in the service of humanity to the man, who makes two blades of grass grow where one grew before, a still higher place must be accorded to the man who makes many blades grow where none had grown before. Many definitions have been given of what constitutes progress and civilization, and doubtless men will continue their disputes in these high matters until the end of time. But there are certain things on which there is something like substantial agreement, and one of these is, that any addition to the productive capacity of the earth must be placed on the credit side of the ledger in the balance sheet of humanity. Up to this present day of grace, no human being has succeeded in supporting existence on this planet without food, and as the number of people on the earth is rapidly increasing, it follows that, unless each individual is content with a smaller share of the common stock, that stock must be increased *pari passu* with the growth of population. It is, however, a common phase of knowledge, that what is called the standard of living among the civilized races of mankind shows a constant tendency to advance, and that the greater facilities of intercourse which have sprung up during the last century have resulted in an increase in the demands which uncivilized, or semi-civilized peoples make on their environment. The consequence is that the demand for foodstuffs, and for the other products which men have discovered how to use for their comfort or enjoyment is always on the up-grade. There



Gathering Pears, Farmington, N. M.

are more mouths to be fed, more bodies to be clothed, and the mouths want more and better food, the bodies more and better clothing. To some extent, these increased demands are met by the opening up of new lands to the labor and industry of mankind. We have a very striking example of this utilization of new areas at the present moment in the development of the Province of Alberta in Canada. But this extensive movement is accompanied by a scarcely less important intensive

movement, the object of which is to increase the productive capacity of already known areas, and in this intensive movement, the engineer plays a part, the significance of which is not, perhaps, always sufficiently appreciated. It is too early to estimate the benefits which will accrue from the scientific invasion of South Africa, but it may be said with certainty that a great and permanent stimulus has been given to thought in many different departments of scientific investigation and inquiry.



Farmington, Glade, Orchard, Farmington, N. M. Owned by G. L. Shumway and others.

Among these departments engineering occupies a deservedly high place. The modern engineer is necessarily a specialist, and there is no branch of the science which has a deeper or more practical interest, in a country with an insufficient rainfall, than in that relating to the application of water to land for the purposes of agriculture; and perhaps there is no branch of engineering which carries with it more danger in hazarding an opinion of what can be done by the application of science to the problems of irrigation. It is precisely because a man is a great expert that he, with equal modesty and wisdom, will not, without very careful study, make an attempt to formulate schemes for the application of irrigation. The expert knows how many and complicated are the factors which must be taken into account before embarking on any large project of irrigation. Statistics of rainfall must be carefully collected; the sources of water supply available, and be tabulated; the possibilities of storage must be considered in relation to local conditions; the water must be analyzed, its temperature ascertained; the soils which it is proposed to fertilize must be carefully examined. These and other questions must all be taken into account before any large scheme can be formulated. Before this is done it is necessary to stimulate interest in the subject by collecting a mass of material to illustrate the benefits which have resulted in different parts of the earth's surface, from the judicious application of water to land by artificial means, coupled with a carefully devised system of drainage. Certainly, there is a large field to draw on, for in its more primitive forms irrigation is one of the oldest means of increasing the productivity of the soil known to the agriculturist. In Egypt and northern India, the natives to this day practice methods of irrigation which their

forefathers have practiced for countless generations. In China and Afghanistan there are districts where much more elaborate systems have been evolved by the local inhabitants, not only with excellent results, but exhibiting, on a small scale, no doubt, some of the very principles which are applied by the modern engineer in the great works which have added so largely to the material wealth of the world.

It is, however, in considering the conquests of the modern irrigation engineer over nature that we are able to realize the immense importance of his work for humanity. In our own Western States, areas which under natural conditions would only have supported the scantiest population, are now the homes of a thriving agricultural community, producing large quantities of foodstuffs and raw material for many industries. The most conspicuous and best known instances of recent times is furnished by the work in Egypt, where the great dam at Assuan, the minor one at Assuit, and the other work which will be completed in about two years,

NEW LINES OF EXPERIMENTS BY THE DEPARTMENT OF AGRICULTURE.

Investigation of unusual interest to the farmers of the semi-arid and the so-called arid regions of the West are now in progress under the direction of Dr. Elwood Mead, chief of the irrigation and drainage investigations of the Office of Experiment Stations.

After careful investigation of the conditions which confront the settlers of the regions of scant rainfall, the office has come to the conclusion that there is need of carefully conducted experiments to determine and advise farmers what are the best methods of crop production in dry seasons. Two methods are being investigated as feasible.

First. For each farmer to provide for himself a small irrigation plant from which he can irrigate a few acres of his farm and on which he can be insured of such crops as will maintain his family and live stock in case of excessive drought.



A Diversion Dam in Eastern Washington.

will represent a total expenditure of more than thirty-five million dollars. But the money has been well spent. It is a splendid investment, for the capital value of the land irrigated is one hundred and forty million dollars.

It would not be difficult to multiply examples of the magnificent results which the irrigation engineer has obtained by the application of science and capital to the land. The subject is one of absorbing interest and opens up a wide field for the beneficent action of governments. Here and there, in restricted areas, or where there is a local population which has reached a relatively high level of civic development, it is possible that private initiative may be trusted to deal with the problem. But, to succeed, irrigation works on a large scale must, in the great majority of cases, be undertaken by some central authority, and as it is certain that with the growing requirements of mankind the utilization of water to increase the productivity of the soil will become more and more a necessity.

Second. By means of special implements and extra cultivation to conserve all the available moisture in the soil for the benefit of the crop, instead of allowing the rain to pass over the surface into the streams and thus be entirely lost to the field.

For the purpose of these investigations experiment stations have been established at Wichita Falls, Tex., Cheyenne, Wyo., and near Imperial, Neb., and the plan is to establish similar stations in the rest of the States in the West where such experiments are of value to the settlers.

For the purpose of demonstrating what can be done by irrigation of small tracts from individual irrigation plants, three different methods are adapted at the three stations already established. At Wichita Falls the water for irrigation is obtained from a storage reservoir which is made by constructing an earth dam across a small creek bed and which obtains its supply from the sur-

face water of the water shed above and is utilized on the farm as desired.

At the Cheyenne station the water is pumped from a creek into a dirt reservoir 1,000 feet away and twenty-five feet above by means of specially constructed windmills of large capacity. Experiences in the past have shown that windmills for irrigation purposes have not been able to supply sufficient water to irrigate more than one or two acres. The reason for this is that the wind velocity is very variable and is oftener eight miles per hour than twenty. Irrigation pumps are designed for large capacity and considerable power and consequently they do not begin to work until the wind velocity is ten or twelve miles per hour, and when the wind increases to twenty-five miles per hour very little more water is pumped than at twelve miles.

Prof. C. J. Zintheo, in charge of Farm Machinery Investigations of the Office of Experiment Stations, has

consists in pumping water from a dug well by means of a gasoline engine and storing it in a reservoir for use on garden truck and such crops as are needed for home consumption. In each case a careful record is kept of the cost of establishing and maintaining the different kinds of irrigation plants, the efficiency of the plant and the increased yield of crops due to the irrigation. Thus the farmer may learn the value of the investment in such plants.

It is believed that when the cost of irrigation water rights, together with the construction and maintenance of ditches is compared with the individual irrigation plant, the latter will have some points in its favor.

It is not expected that the farmer will be able to irrigate all of his land by this method, so the second point of these experiments consists in determining how the farmer may produce the largest crops on the balance of his farm without irrigation.



A Flume Across River in Montana.

had designed an attachment for windmills which will automatically regulate the length of the stroke of the pump with the velocity of the wind so that at a wind velocity of five miles per hour the stroke of the pump is but two inches in length and a small amount of water is pumped, while at thirty miles per hour the stroke is increased to twenty-four inches and a great volume of water is pumped. Thus all the available power of the wind is utilized and the efficiency of windmills for irrigation purposes greatly increased. Experiments with two wheeled windmills compared with single wheeled mills and the automatic pumping attachment are now being conducted at the Cheyenne Experiment Station which promise to be of great value to the individual irrigator. Experiments are also being conducted with winter irrigation compared with summer irrigation. By this means a double irrigation period can be established as the water which runs away in winter can be conserved and stored in the soil and the spring freshets can be utilized for summer irrigation on another piece of land.

At the Nebraska station the irrigation experiment

For this purpose Professor Zintheo is having special grain drills made which will plant the small grain in deep furrows something like the corn lister plants the corn, leaving the soil between the drill rows in ridges. This plan has the advantage of putting the grain down deep in the soil where there is sufficient moisture to germinate it and at the same time not cover it too deeply. It also has the advantage of protecting the young plants from the wind, to prevent the soil from blowing and drifting, and to catch all of the moisture which falls in these furrows and to convey it to the plant roots instead of allowing it to run off the land as it does when the top surface is smooth. Different depths of plowing and subsoiling are also practiced. Special cultivators have been made for intertillage of small grain during the growing season to provide a soil mulch and to prevent the evaporation of the soil moisture.

The experiments are planned to determine what distance apart in drill rows will give the best yield; what is the effect of different methods of intertillage compared with no tillage during the growing season;

what is the effect of tillage on irrigated land and what is the effect of irrigation without tillage, as well as the effect of neither irrigation nor tillage on different widths of drill rows. In this way it is hoped to be able to determine just how much extra labor in tillage and irrigation a farmer may afford to put on his land to make it pay in increased yield of crops.

The various implements used are also tested for draft with dynamometers to determine the actual amount of energy and horsepower required to operate them. Drills and planters are calibrated for accuracy of planting the crops. From the experiments already conducted it has been learned that with such crops as corn, beets and cotton, the yield may be largely increased and the labor reduced by the grading of the seeds into uniform size and by the use of planters which will deposit the seeds a predetermined number in a hill or a uniform distance apart in the row. Another line of investigation which the office has under way is to determine the efficiency of denaturised alcohol as a substitute for gasoline and kerosene in lamps, stoves and in-

FACTS THAT ALL SHOULD KNOW.

In view of the unfounded reports with relation to the recent earthquake at San Francisco and other points in its neighborhood, the facts regarding the Sacramento Valley should be made widely known.

This earthquake was barely felt in Sacramento and the Sacramento Valley generally, and did absolutely no harm in this city or any other point in the valley.

In all the history of California there is no record of a serious or destructive earthquake in this city or elsewhere in this valley, causing loss of life or ruining any substantial building.

Among the people of this city and the valley, including the oldest inhabitants, there is no fear of earthquake. The slight tremors that have at times been experienced are not of an alarming character.

The floor of the valley consists of alluvial deposits of earth, sand, clay and gravel, extending to a known depth of nearly half a mile and probably much deeper.



A Steam Dredger in Operation, Loading Cars on the Banks of the Truckee Canal, Nevada.

ternal combustion engines, and to determine its cost of manufacture from various farm products such as corn, potatoes, beat pulp and molasses from sugar factories. Congress has recently passed a bill which removes all internal taxes from alcohol used for industrial purposes. If the Senate should pass the bill it will mean a great development in agriculture, as without tax this grain alcohol can be manufactured for from 12 to 15 cents per gallon, and the farmer may be able to obtain cheap power, light and heat from his own farm products which will pump his water for irrigation, propel his farm implements and do other farm work, light his house and cook his meals.

This loose formation is believed by geologists to afford security against destructive earthquakes, as any serious jar from the solid rock far below must be dissipated and lost in the alluvium, as the force of a bullet is spent in sand.

The San Francisco earthquake caused small loss in comparison with the fire which followed it. And that earthquake was not more characteristic of California than the Charleston earthquake was of the Atlantic Coast.

No such shock is likely ever again to visit any part of California, and certainly not the City of Sacramento or the Sacramento Valley.—*The Evening Bee, Sacramento, Cal.*

Our readers are requested to send us in the address of friends to whom you wish sample copies of Irrigation Age mailed.

Send \$2.50 for The Irrigation Age
1 year, and the Primer of Irrigation

**REPORT OF COMMITTEE ON IRRIGATION OF
THE NATIONAL ASSOCIATION OF MANU-
FACTURERS, ADOPTED AT ANNUAL
MEETING, MAY 15.**

To the Board of Directors and Members of the National Association of Manufacturers:

Your standing Committee on Irrigation begs to report as follows:

The past year has been chiefly remarkable in irrigation circles for the opening of the first government irrigation project in the country. This is known as the Truckee-Carson project in Nevada and consists of 300 miles of canals which distribute water to 50,000 acres of land, as a result of an expenditure of approximately \$2,000,000. When this project is completed 400,000 acres will be irrigated at a capital cost of \$9,000,000.

The Reclamation Service has investigated a large number of projects in all the sixteen states and territories affected by the Reclamation Act of June 17, 1902. As a result the Reclamation fund, estimated at about \$28,000,000, has been apportioned as follows:

State.	Name of Project.	Acres Irrigable.	Allotment
Arizona	Salt River	160,000	\$3,850,000
California	Yuma	85,000	3,000,000
Colorado	Uncompahgre	100,000	2,500,000
Idaho	Minidoka	60,000	1,300,000
Idaho	Payette-Boise	60,000	1,300,000
Kansas	Garden City	8,600	280,000
Montana	Huntley	30,000	900,000
Montana*	Milk River		1,000,000
Montana (two-thirds)	Lower Yellowstone	40,000	1,200,000
Nebraska and Wyoming	North Platte	100,000	3,330,000
Nevada	Truckee-Carson	120,000	3,000,000
New Mexico	Hondo	10,000	240,000
New Mexico	Carlsbad		600,000
New Mexico	Rio Grande		200,000
North Dakota (one-third)	Lower Yellowstone	20,000	700,000
North Dakota	Pumping Plants	33,000	1,000,000
Oregon	Klamath	100,000	2,000,000
Oregon	Umatilla	18,000	1,000,000
South Dakota	Bellefourche	60,000	2,100,000
Utah	Strawberry Valley	25,000	1,250,000
Washington	Okanogan	9,000	600,000
Washington	Yakima	40,000	1,750,000
Wyoming	Shoshone	76,000	2,250,000
		1,153,600	\$35,230,000

* For Dam in St. Mary—Will not irrigate any land.

Work has actually commenced on the following projects:

State.	Name of Project.	Acres Irrigable.	Allotment
Arizona	Salt River	160,000	\$3,850,000
California	Yuma	85,000	3,000,000
Colorado	Uncompahgre	100,000	2,500,000
Idaho	Minidoka	60,000	2,600,000
Idaho	Payette-Boise	60,000	1,300,000
Montana	Huntley	30,000	900,000
Montana	Lower Yellowstone	60,000	1,900,000
Nebraska and Wyoming	North Platte	100,000	3,500,000
Nevada	Truckee-Carson	120,000	2,740,000
New Mexico	Hondo	10,000	280,000
New Mexico	Carlsbad	15,000	600,000
South Dakota	Bellefourche	60,000	2,100,000
Oregon and California	Klamath	100,000	2,000,000
Wyoming	Shoshone	75,000	2,250,000

It is anticipated that these schemes will exhaust the funds at the disposal of the Reclamation Service for at least ten years, and consequently the government will not be enabled to undertake fresh work for that period unless other funds are placed at its disposal. At the present time Congress does not seem disposed to make any further provision for irrigation work and it would probably be useless to attempt to influence an appropriation for this purpose until the work already undertaken by the government has been carried to completion and the experiment of the Reclamation Act has proved successful. In this connection it might be pointed out that

the government work, excluding two small projects of uncertain area, affects a total area of 1,153,600 acres. In 1890 there was a total of 4,115,000 acres of irrigated land in the United States; ten years later this has increased to 7,300,000, and in 1902 to 9,481,841; thus nearly ten million acres has been brought under water by private enterprise before the Reclamation Act was passed.

How far this private enterprise has been stopped or checked by the passage of the Reclamation Act and the commencement of government work, your committee has been unable to definitely ascertain. There seems to be no doubt, however, that the withdrawal of large acres of irrigable land from settlement under the terms of the new act must have prevented certain private projects being carried out. At the same time were the government to leave these lands as freely open to settlement as they have been in the past it is quite possible that when the time came to actually commence operations and attempt to irrigate the land it would be found private speculators had absorbed the public domain and possibly tapped the water supply in such a manner as to impede or even to totally prevent the carrying out of the government schemes. Cases have indeed already occurred in which this has happened, and the result has been that the Reclamation Service has withdrawn vast areas from settlement, so vast indeed that complaints have reached your committee from persons in the West that the cause of irrigation and Western development has been hampered thereby. If some scheme could be devised whereby the rights of the public and individuals might be alike safeguarded, it would appear desirable. Possibly this end might be reached by allowing settlement subject to the approval of the Secretary of the Interior and by allowing natural water sources to be tapped by private individuals, also subject to the secretary's approval. In this manner it would be possible to make sure that nothing was done by any private individual to the detriment of the public welfare. At the same time private enterprise would not be stifled as in some instances, at least, it is likely to be at present.

There is little doubt that the officials of the Reclamation Service are actuated by a genuine desire to further the cause of irrigation and that any mistakes they may have made have been due rather to overzeal than to lack of interest. The work they are doing is a great work and one which in its most important features, at all events, could not be carried out by any other existing body. The private irrigation schemes to which reference has been made are mainly, if not entirely, located within single states and most of them affect comparatively small areas of land. Many of the government schemes are of an interstate nature, or at least are such as will raise questions of interstate water rights and out of twenty-three projected schemes sixteen will exceed \$1,000,000 each in cost. It would thus appear obvious that there is room for the government to work side by side with the private individual, leaving to private enterprise the development of the smaller areas and restricting its attention to such vast schemes as the Truckee-Carson project, which are obviously beyond the comparatively limited resources of the sparsely populated states.

The successful irrigation of the arid and semi-arid West will, as it is gradually brought about, entirely alter conditions in that portion of the country. It is

the more desirable, therefore, that these changes should be made with due regard to the rights of those now living in the country to be irrigated, and with due consideration of the benefits to be derived by the nation as a whole. Although there are immense areas, ex- as the irrigable area, there are some of them bordering on these lands and some removed therefrom, still vaster areas (approximately 500,000,000 acres) to which no water can be artificially brought. That these lands, in addition to the irrigated lands, may be made of the fullest value to the nation is one of the problems our legislative bodies have to face. It is not strictly a problem of irrigation, but it is a problem so closely united thereto that irrigationists may well consider it.

It is a mere axiom to say that the ranchers and stock raisers were the men who made the arid and semi-arid regions of this country what they are today. Had it not been for them the plains now given over to flocks and herds might still be hunting grounds of irresponsible and sometimes dangerous Indians. When first the stockman, taking his life in his hands, invaded the unknown region between the Missouri and the Rocky Mountains, he was alone with his herd in a vast and unknown country. His cattle, sheep and horses could graze at will, without let or hindrance from any man, assured that the buffalo and the red man, then the only other denizens of that country, would leave him unmolested, in so far that is a guarantee of sufficient food for his live stock was concerned, though his own life might be and often was in danger. As time went on the country began to settle up, the Indians and buffalos were driven further and further into the back-ground, until today the buffalos are extinct and the red men rapidly becoming so. The feeding grounds of the one and the hunting grounds of the other have become the center of one of the greatest industries of this country; but with the change has come a change in the conditions surrounding the growing of live stock. The rancher himself is reasonably safe in life and limb, but every year it is becoming harder for him to assure his flocks and his herds the feed which alone can make them profitable. The original pioneer has become surrounded by competitors, none with superior but all with equal rights to his own. The result has been that the range, once amply sufficient for the grazing of his animals, has become, or at least is rapidly becoming, insufficient. It is now by no means an uncommon thing for the rancher with a few hundred sheep or a small herd of cattle to graze his flocks on the high grounds during the summer and have picked out in his mind some convenient land contiguous to his home ranch on which they are to be fed in the winter. By the time winter comes, however, some other rancher's stock has grazed over this land, leaving the first man either to buy feed or to go further afield in search of that free range on which he has been accustomed to rely.

This state of things has led to many serious breaches of the existing land laws of the country. Large areas of the public domain have been placed under fence by those without legal title to them. Clashes have occurred in some instances between armed forces representing different ranchers anxious to utilize the same portion of the range. A condition has arisen which, in our opinion, calls for immediate change in the existing land laws. The rancher may not buy public lands, he may take his homestead, and must then stand

his chance of finding grazing grounds for his flocks and herds in a country which for live stock raising under modern conditions is in many instances already overcrowded. If the present state of things is allowed to go on the amount of public lands illegally fenced will increase annually, the amount of land available for irrigation purposes under the terms of the Reclamation Act will be annually circumscribed. The amount of land which can never be used for anything but ranch purposes, but which lies contiguous to irrigable lands and should, if it is to be made of the greatest possible



A Tunnel Through Mountain for Delivery of Water for Irrigation.

value, be made appurtenant to such irrigable lands, is also rapidly disappearing. The problem we face is to preserve these lands so that they may eventually be made of the fullest possible benefit to the public and also to provide the rancher while he exists under modern conditions with reasonable safeguards for the proper prosecution of his industry.

The Canadian government has frequently proved its wisdom by the care and thoroughness with which it has profited by the experiences of this country. The Canadian West is in many respects similar to the ranching states of this country, and the problems presented by the one are very largely presented by the other. The Canadian government has solved the land question,

or, at least, that portion of the land problem which relates to the ranches, by granting leases on 100,000 acres or less for terms not exceeding twenty-one years at an annual rental of 2c per acre, provided that within three years the rancher will place upon the land one head of cattle or five head of sheep for every twenty acres covered by the lease. Should the number of live stock fall below this amount at any time during the life of the lease the leasee is liable, on receiving three months' notice, to have withdrawn from his leasehold an area of twenty acres for every head of stock less than the number called for. No one, however, is permitted to lease land unless he has already taken a homestead or purchased 160 acres on which to place his buildings. By the Canadian law regulations are also made for the protection of public hay lands.

Canada, however, is not the only place in which the leasing experiment has been tried. The great State of Texas is probably the largest individual landlord in the United States. There are in the State 18,000,000 acres of public land belonging to the State and not to the Federation. These lands are largely leased under an act providing for what is practically competitive bidding as to the amount of rental to be paid. The State lands of New Mexico, Montana and many other western states are also subject to lease.

The leasing of the public lands of the country accomplishes four things:

1. It guarantees to the rancher a sufficient grazing area for the sustenance of his flocks and herds.
2. It preserves as a part of the public domain the great range lands of the country, thereby enabling the nation to make what disposition it pleases of them in the future and at the same time insuring their being adequately utilized pending their final disposition.
3. It prevents all chance of land frauds and the illegal fencing of public lands because it removes the reason therefor.
4. It encourages the preservation of the utility of the land instead of its destruction by over-grazing.

Should the public lands now under the administration of the Federal government be leased as they are in Canada, and as the State lands are in Texas, New Mexico and elsewhere, and it was afterward found possible to irrigate any or all of them, provision should be made so that the nation could readily reobtain and bring the water to them.

Irrigated lands will support a vastly greater number of people than similar non-irrigated lands; indeed, cases are not uncommon of from 200 to 500 people being supported by the product of a single section of irrigated land. It is, therefore, probable that as the irrigation of the West is carried out it will be found desirable to place a severe limit to the homesteads allowed to individuals. There will, however, always be large areas contiguous to irrigable lands which can not be irrigated. Indeed, out of a public domain of 535,486,000 acres in the sixteen states and territories mentioned in the Reclamation Act, only about 60,000,000 are believed to be irrigable. The cattle grazing upon these unirrigated lands will have to be provided for during the winter. At the present time many ranchers unable to obtain meadow land are forced to pay exorbitant prices for hay with which to preserve their flocks and herds. It is more than possible that as the various irrigable areas are brought under water it will be found desirable to

apportion them either by sale or lease to the ranchers controlling the surrounding still waterless land in order that those who are grazing their stock on the dry lands may be able to obtain meadow land on which to raise winter feed. These are matters which in our opinion deserve the earnest and immediate attention of Congress, for the longer the present chaotic state of the Federal land laws is allowed to continue the more difficult will the final settlement be.

L. M. Byles, chairman; A. E. Cheney, C. W. Asbury, F. S. Kretsinger, C. F. White.

ITS METHODS TRICKY.

The *Spokesman-Review* calls attention to a matter that needs looking into and if it be found to be as asserted the men complained of should be taught a lesson they will not soon forget. "It is deplorable," it says, "that the National Irrigation Association is adroitly using money subscribed to foster irrigation to distribute printed matter attacking President Roosevelt's railroad rate regulation policy. The association is scattering broadcast in its envelopes and under its stamp copies of a recent editorial page from the *St. Paul Pioneer Press*. This page carries two editorial articles, one dealing with irrigation and the other the stereotyped railroad argument against 'any form of rate regulation that would involve the fixing by any other agency than the railroads themselves.'

"Ostensibly the purpose is to disseminate irrigation literature, but it does not require half an eye to see that the real purpose is to place James J. Hill's well known views against rate regulation before the irrigation interests of the United States.

"The railroad article in question is given a position over the irrigation article in part and in part alongside it, so that in marking the irrigation article the association has in fact adroitly directed the attention of the readers to the much longer article against government control of railroad rates.

"The medium chosen for this cunning piece of work is the *Pioneer Press*. If the National Irrigation Association wants to destroy its standing and its influence and cut away a large part of its support, it has only to continue these tricky tactics."—*Great Falls (Mont.) Leader*.

FAVORABLE INDUSTRIAL LOCATIONS.

The North-Western Line traverses a territory famous for its great agricultural productiveness. Its splendid development in this respect has founded and sustains many prosperous towns and cities equipped with all the conveniences of modern times. With the growth of this fertile district there arises a demand for the utilization of the high class of help that can give attention to manufacturing industries. Beside this desirable advantage to manufacturers there are many natural resources of much value. The most favorable home environment is found in this rich and growing Northwest, an element that contributes considerably to a satisfactory and permanent business location.

The transportation facilities afforded by the North-Western Line are unsurpassed, giving prompt communication with the sources of supply and the markets of the world. To provide information to parties seeking new locations for industrial enterprises the North-Western Line is giving special attention.

RECLAMATION NOTES.

The town of Mitchell, Neb., has been selected as headquarters of the engineers on the North Platte irrigation project until construction is completed. This point is in the center of the project and it is proposed to construct there a commodious office building for the use of the Reclamation Service engineers.

The Secretary of the Interior has today restored to settlement the following described lands in the State of Nebraska, which were withdrawn in 1903 for use in connection with the North Platte irrigation project:

SIXTH PRINCIPAL MERIDIAN.

T. 20 N., R. 54 W., Secs. 19 to 36 inclusive.

T. 20, N., R. 55 W., Secs. 18 to 36 inclusive.

T. 20 N., Rs. 56, 57 and 58.

T. 19 N., Rs. 54, 55 and 56.

These lands will not be subject to entry, filing or selection under the public land laws until ninety days after notice by such publication as the Commissioner may prescribe.

An item has appeared recently in several Colorado papers to the effect that the Government has begun the construction of a dam in Las Animas River for the reclamation of thousands of acres of arid land in that region. This statement is entirely erroneous, as the Government has no interest in nor connection with any engineering work on this stream. The only irrigation project of the Reclamation Service in Colorado is in the Uncompahgre Valley.

Investigations and surveys in connection with the Lake Basin project, Montana, having reached a point where it has been determined that the lands withdrawn on October 18, 1905, are not irrigable thereunder, the Secretary of the Interior has restored these lands to settlement, not, however, to become subject to entry, filing or selection under the public land laws until ninety days after notice by such publication as may be prescribed by the Department. The area restored lies principally in Yellowstone County and consists of about sixteen townships.

The Secretary of the Interior has executed a contract with, and approved the bond of the United Iron Works of Oakland, Cal., for furnishing gates and lifting devices for use in the main canal and embankments of the Payette-Boise project, Idaho. The contract calls for fourteen 5x9 cast iron gates and guides weighing 70,000 pounds; eight 5x6 gates and guides, 32,000 pounds; two standard 6x8 gates, with lifting devices and ball-bearing pedestals for raising 80,000 pounds; and twenty-two standard ball-bearing lifting devices for raising from 15,000 to 30,000 pounds. The total contract is for \$15,045.

The Secretary of the Interior has executed a contract with Henry C. DeLaney, of Williston, N. D., for the construction and completion of Division 4, main canal, Lower Yellowstone project, Montana and North

Dakota. This contract calls for the construction of nine and a half miles of canal, involving 465,300 cubic yards of excavation, 85,000 cubic yards of overhaul, 500 linear feet of 24-inch terra cotta pipe, and 1,000 cubic yards of puddling.

The construction of the Truckee-Carson project, Nevada, is progressing rapidly. At the present time 85 per cent of the works required to supply the first 180,000 acres is completed. During the present stage of high water in Carson River the Truckee River is not supplying the system, as the flow of the former is ample at this time. Three vitrified pipe openings have been set in the main canal and water will be delivered to settlers under this part of the system during the month of May. The old and new settlers under the main distributing system are now receiving their supply therefrom, and with the exception of two districts the lateral system are now delivering water. It is expected that the entire lateral system will be in working order at the end of the month. On force account work now being carried on by the Government in six camps, 400 men and 450 head of stock are employed.

Recent investigations and surveys having indicated the desirability of modifying the original plans for the construction and completion of the pumping station for the Huntley project, Montana, the Secretary of the Interior, with the approval of the contractor, W. D. Lovell, has annulled that portion of the contract which relates to the construction of the pumping station and accessory structures. The change proposed by the Reclamation Service will result in securing a simple, compact and durable design for the machinery and pumping station, which can be put into use at a less cost than the original design.

The public lands embraced in about 150 townships in eastern and central Washington, withdrawn during 1903, 1904 and 1905, pending investigations to determine the feasibility of the Big Bend, Priest Rapids, Palouse and Chelan projects, have been restored to settlement by the Secretary of the Interior. They will not be subject to entry, filing, or selection under the public land laws, however, until ninety days after such notice by publication as may be prescribed by the Department.

In compliance with the request of the Secretary of Agriculture, authority has been granted the Reclamation Service by the Secretary of the Interior to sell cement and other supplies, and to furnish electric lights, telephone service and sewerage connection to the Forest Service located in Tonto Basin, Arizona, in the vicinity of the Salt River project.

During the years 1904 and 1905 all the public lands within an area of about one and a half million acres in the Klamath region in southern Oregon and northern California were reserved, pending investigations to determine the feasibility of reclaiming them under the Klamath irrigation project. Of this area about one-half has been restored to entry, the balance remaining reserved as lands reclaimable, for reservoir

sites, or for rights of way. These lands will not be subject to entry, filing or selection under the public land laws, however, until ninety days after notice by such publication as may be prescribed by the Commissioner of the General Land Office.

The Secretary of the Interior has approved the contract on behalf of the United States with the Illinois Steel Company, of Chicago, Ill., for supplying 14,000 barrels of Portland cement for the Payette-Boise project, Idaho. The price of the cement is \$1.60 net per barrel, delivered f. o. b. cars at the works of the Illinois Steel Company, Chicago.

The Secretary of the Interior recently restored to the public domain the N. E. $\frac{1}{2}$, Sec. 20, T. 25 N., R. 63 W., Cheyenne land district, Wyoming. This land is not subject to entry, filing or selection under the public land laws until ninety days after notice by such publication as the Commissioner of the General Land Office may prescribe.

The Secretary of the Interior has approved an agreement dated October 16, 1905, and a supplemental agreement dated December 26, 1905, with C. S. Moore and wife and R. S. Moore and wife, for the transfer to the United States for a nominal consideration, certain valuable irrigation works, water rights and riparian rights owned by the Moores along the west bank of and in connection with Link River, Ore. The United States is to deliver to the grantors 205 second feet of water which they now claim, for the generation of power, with the right to substitute therefor equivalent power, and to relieve the grantors of any cost of new construction except \$50 per annum as their proportionate cost of maintenance and operation. The United States is to provide in any dam which may be constructed across Link River a suitable gate through which logs and lumber may be floated, and further assumes the existing obligations of the grantors for delivery of water for the irrigation of certain lots in the town of West Klamath.

The Secretary of the Interior has restored to settlement the vacant, unappropriated public lands not otherwise reserved, in a tract consisting of about 800,000 acres in western Montana, which was withdrawn in connection with the proposed Cabinet Forest Reserve. A small part of the area is included in the Flathead Indian Reservation. The lands thus restored will not be subject to entry, filing or selection until ninety days after notice by such publication as may be prescribed by the Department.

The Secretary of the Interior recently approved a contract on behalf of the United States with Messrs. Page & Brinton, of Salt Lake City, Utah, for the construction and completion of the work provided for in schedules 2 and 3, main canal, Payette-Boise project, Idaho. The contract calls for the excavation of 583,000 cubic yards of material. The bid for both schedules was \$135,900.

Mr. Robert E. Norton, for several years in charge of hydrography in the eastern part of the United States,

with headquarters at Utica, N. Y., will sever his connection with the United States Geological Survey on June 1, in order to study special hydraulic problems connected with the New York barge canal.

The Secretary of the Interior today temporarily withdrew, from any form of disposition whatever, approximately 50,000 acres of land situated in townships 1, 2 and 3 N., Rs. 28 and 29 E., within the Crow Indian Reservation, Montana, and lying under the proposed canals of the Reclamation Service in the Huntley project. The absolute withdrawal was recommended because the location of necessary pumping plants and other irrigation works had not yet been definitely fixed.

Authority has been granted to the Reclamation Service to purchase under competitive bids at a cost not to exceed \$4,500, the necessary sand crushing machinery to be used in the construction of the Klamath project, California and Oregon.

The Secretary of the Interior has awarded a contract to E. A. Hess, of Lyons, Iowa, for the construction of a telephone system in connection with the Strawberry Valley irrigation project, Utah. The work involves thirty-five miles of pole line and four telephone stations, the line to extend from Spanish Fork to the dam site. According to the terms of the contract the work is to be begun within twenty days after notice of the signature of the contract by the Secretary of the Interior and completed on or before the expiration of ninety days thereafter. Six bids were received, that of Mr. Hess being \$635.00.

The Secretary of the Interior has advised the Yellowstone Park Railroad Company, which is constructing a railway in eastern Idaho, that its application for right of way across Flat Rock reservoir site will be approved, providing it will agree upon demand of the Secretary of the Interior, at its own cost and expense, and without claim for compensation, reimbursement, or damage, to remove and abandon or otherwise change the location of so much of the line proposed to be constructed across this site as to avoid interfering with the utilization of the reservoir site for water storage.

Mississippi and eastern Louisiana are about to receive the attention of the Geological Survey. In response to numerous requests from many parts of this drainage area the Hydrographic branch will establish at once a number of river stations for the purpose of collecting data in connection with the development of water power and the irrigation of truck farms.

Mr. W. E. Hall, a representative of the Hydrographic Branch, has recently made reconnaissance to locate suitable points for obtaining reliable data concerning the flow of several streams in this section. As a result of these reconnaissances gauging stations will be established at once on Tallahatchie River near Batesville, on Yalobusha river, near Grenada in northern Mississippi, on Homochitto river, near Rosetta in southwestern Mississippi, and on Tangipahoa River, near Amite and on Bogue Chitto, near Warnerton in eastern Louisiana. The establishment of additional stations will depend upon the finding of suitable points and upon the availability of funds to carry on the work.

Mr. M. R. Hall, hydrographer in charge of the stream gauging work in the Southern States, has spent years in the study of the behavior of southern rivers. His supervision of this work insures a careful collection of reliable data.

The demands upon the Survey for the results of its investigations in other sections and for the initiation of similar work elsewhere have increased enormously in recent years. These requests by their scope indicate a proper appreciation of the value of the work of the Survey and furnish proof of the need of its continuance and extension. They are not only from those interested in large enterprises looking to the utilization of water power, but from the municipalities along the streams whose growth has made the question of water supply a paramount one, and from districts in which truck farming has become a prominent industry.

The publication of the results of the hydrographic investigations has been followed quickly by the installation of power plants on streams and discharge of which has been found by the Survey to be ample. Many notable cases might be cited in this connection as illustrating the importance and economic value of the data obtained by the hydrographers, working either in co-operation with state governments or along the Survey has surveyed and mapped hundreds of rivers, and for a term of years has kept accurate records of their fluctuations and flow. This work in a large measure has been responsible for the progress in the East and South of the manufacturing interests.

FIGHTING FOR HELPLESS SETTLERS.

Major Fred. R. Reed Arraigns Reclamation Service.

"Yes, I seem to have matched a fight against the whole reclamation service with the entire press bureau at its command," said Major Fred. Reed to a Boise (Idaho) *Capital News* reporter, "but as it is a fight in the interest of a large number of American citizens, who have been misled by the representatives of the American Government, I shall continue the fight until something is accomplished, for there is right to my side of the controversy.

"That tract of country embraced in the Minidoka project consists of upward of 125,000 acres of land, through which Snake River runs. All this was first withdrawn from entry when the project was first proposed. Private parties wanted to irrigate the land, but the reclamation service took it away from them and advertised to the world what it was going to do. They have opened the country to settlement and the people accepted the invitation of the Government and went in there, taking up the farm units of eighty acres each, with the understanding that the lands on the north side of the river were to be watered by the gravity system, while those on the south side, except about 10,000 acres, were to be supplied through a pumping system. The great engineers of the great Government represented that the plan was feasible and that the work would be done, and \$1,300,000 was set aside for this purpose.

"After the settlers had taken the lands and made improvements, spending all their money, ranging from \$600 to \$1,000 each, they are suddenly informed that the reclamation engineers have changed their plans

and that these 'foolish settlers' can have no water for many years, if ever.

"Because I don't approve of such a bunco game on the part of the reclamation service, and have endeavored to do something in the interests of the settlers who endeavored in good faith to secure homes for themselves in the Government project, Mr. Newell and his press bureau accuse me of trying to use this means of booming a town for the purpose of selling town lots.

"This is about as logical an argument as the head of the reclamation service is capable of making. Most men would refrain from publishing statements that the settlers surrounding their town were to fail through the action of the Government in failing to carry out its agreements with them, until they could dispose of their holdings. We secured the Burley townsite on some patented lands, and are making a town there regardless of the Government water. We are preparing to water the town through a pumping plant. A large carbide factory is being established that will give employment to a great many men; a railroad is to be built this season from Burley to the county seat at Oakley; the Short Line engineers are surveying the new cutoff to Malad, which will shorten the distance to Salt Lake seventy-two miles. These and other projected enterprises will make the city, regardless of what the Government does, and the town, which is now only second to Twin Falls, will take care of itself.

"Neither I nor any of my kinsfolk have any claims on the lands which the reclamation service have robbed of the water promised when the settlers were invited to go there, so they can not say that this is a personal fight. It is one of principle, in the interests of the settlers who have been betrayed by the officers of the Government which they have been raised to believe in.

"The reclamation service located three towns on the north side of the river, which will be built, some time. That we presumed to go onto deeded land and start a town outside of their jurisdiction seemed to have brought down their wrath, but that can't be helped.

"A circular from the general land office of January 26 states that all of the entries in the Minidoka project have been settled upon by bona fide settlers, but half of these can receive no water within any reasonable time, nor will the reclamation service give any information on the subject. In fact, if anyone has ever received the first bit of reliable information of any kind from the reclamation service, that fact has escaped me. All that I have ever heard of their accomplishments has been in the way of banquets, blue prints and 'bull con.' They have never reclaimed an acre of land, and there is no telling whether or not they ever will until the department has been placed in the hands of men who are competent to make practical plans and carry them out in a practical way. If this can be brought about, deserving settlers will no longer be misled into sacrificing all that they have in their efforts to secure homes, and we will all see some good results from the efforts I am making against the unbusinesslike, over-theoretical methods so far pursued."

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1 year, and the Primer of Irrigation

EXPLAINS MISTAKES.

The editor of IRRIGATION AGE is quoted in the Lewiston (Idaho) *Tribune*, of recent date, as follows:

D. H. Anderson, editor of THE IRRIGATION AGE, of Chicago, Ill., visited in Lewiston yesterday en route to the coast. In an interview last evening with a *Tribune* reporter, Mr. Anderson said:

"I have come here attracted by the widespread reputation which your territory has attained for its productiveness. The inland empire and Lewiston-Clarkston are largely quoted throughout the country, and my impression is that you have here the base for a population of upward of 50,000 in the near future. The people of the East are just beginning to realize the importance of this famous section of the inland empire, where 33 per cent of the wheat of the Northwest finds an outlet and market. I am informed by those who are competent to speak that the territory adjacent to your city will produce at no distant day 25,000,000 bushels of wheat, and, this being true, it is easy to realize the possibilities in the way of commercial and political development. One feature especially noticeable to one who has studied the development of eastern cities is the perhaps oft-quoted comparison of your location with Pittsburg, being at the head of navigation with water open to the Pacific coast. You are, moreover, in close proximity to mineral deposits of quantity sufficient to enrich a nation, while your possibilities in the way of timber and coal productions are, I am informed, unlimited. There are other features—your great fruit production, immense granite and marble deposits, all of which should produce untold wealth in the not distant future. Taken all in all, I believe no western city possesses advantages exceeding those of Lewiston-Clarkston.

RECLAMATION LAW.

"The original intent of the reclamation law, as its friends understood it, was to reclaim areas and develop territory impossible to private capital; that is to say, it was expected that the engineers in charge would undertake great storage projects and go into fields considered of too great magnitude for timid individual investors for the field of private enterprise. At the time the reclamation law was under consideration several changes were made, among them one clause to the effect that money secured under the law could also be used in giving assistance to private projects then in operation which had been able to secure only a partial water supply. This clause, it is charged by those who have followed development work, had been taken advantage of and in one case, that of the Salt River scheme in Arizona, it is asserted that the cost of the Roosevelt dam and accompanying expenses, something like \$3,000,000 has worked to the direct benefit of those holding land under it, in so far as to bring the land values up so that it has permitted many holders to unload at a heavy advance on people who must comply with 'signed water user's contract,' those from whom they purchased stepping out from under with a large profit made possible by the United States reclamation service officials. There could, of course, be no serious objection raised to this move if not for the fact that it has been shown that the same amount of money, had it been expended in an-

other section of Arizona (the San Carlos project) would have reclaimed at least 360,000 acres of virgin land, which would have thereby been thrown open to settlement to the hungry homeseekers whom this service is supposed to assist. If this is true, does it not lead one to wonder why the Salt River or Roosevelt site was selected instead?

"This is only one of the many similar instances where it would appear that private rather than public interest has been subserved.

"I believe that it would be wise on the part of Congress to throw around the expenditure of this vast sum of money, amounting in all to thirty or forty million dollars, all possible safeguards. Instead of the expenditure of this vast sum being left to the discretion of one or two subordinate individuals, would it not be better that it be placed in the hands of a competent board composed of able engineers and business men, such as obtains in connection with the work being done on the Panama Canal?

FOREST RESERVE DATA.

"I observe that your Senator Heyburn is making a clean fight against the encroachments of the forest bureau whereby something like fifteen or eighteen millions of acres of your best land will be completely lifted from the market. Some of the papers of the State of Idaho I notice are trying to give the impression that the distinguish senator stands alone in his position. If I, as an alien, may be permitted to express my opinion, I would say that the senator is not alone and it may be learned by your good people later on that a more careful scrutiny of the action of 'Forest King' Pinchot and his band of assistants would at this time be valuable; one feature that should not be overlooked is that all this vast sum of money, secured under the leasing laws and for the sale of timber from the 'reserves,' is not turned in as is other money to the treasury of the United States, but is held as a separate fund, a 'revolving affair,' and, as I understand the matter, this distribution is entirely at the disposal of the officials of the forest bureau. No one for a moment questions the integrity of the head of that bureau, even though they may at times be inclined to differ with him concerning his ability to wisely expend that vast sum of money without being subject to the ordinary methods adopted by the Government in safeguarding its expenditures of public funds. There is probably no other man in the public service who is given such wide latitude, unless, possibly, the President himself. When it is considered that negotiations for the purchase of large quantities of lumber running into millions of feet, as well as the grazing privileges, as shown by a recent resolution introduced by Senator Heyburn, amount to about \$700,000 per annum, are carried on by the shrewdest men to be secured by private interest competing for these privileges, and when the ambition and vanity of the chief forester are considered, would it not appear to be placing too much responsibility in an individual?"

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UTAH \$3,000,000 RICHER.

Strawberry Valley Irrigation Project Assured by Appropriation from Reclamation Fund of \$1,250,000.

Four years after the enactment of the national irrigation law Utah is given a promise to share in the benefits of the law, although the benefits are still three years in the future.

Now that the way has been cleared for actual work there will be rejoicing all over the State. This rejoicing will be coupled with the hope that Federal help will not stop with the Strawberry Valley project, but that the Utah Lake project, the Bear Lake project and the Weber River project will be taken up at once so that the aid of the government will be general, that it will be extended where it will benefit a large number of inhabitants and make homes possible for many thousands more.

GOOD NEWS FROM EAST.

Dispatches from Washington, D. C., announced that Secretary E. A. Hitchcock had approved the Strawberry Valley project. This was done only after the matter had been considered by President Roosevelt and his cabinet. Secretary Hitchcock was opposed to the project. He was overruled in the matter. After a decision was reached \$1,250,000 was set apart from the reclamation fund to pay for the work of carrying the Strawberry through the Wasatch Mountains into Utah County. It was given out in Washington that the actual work of construction on the scheme will be started in the spring and that it will continue three years.

Nothing could be simpler than the Strawberry Valley project. The stream is one of the feeders of the Colorado River. It drains some of the highest mountains in the Utah range in Eastern Utah.

After leaving the mountains the stream passes through an extensive flat valley. Finally it forces its way through a narrow canon between high hills. At this point it is designed to build a dam for the purpose of impounding the water. The valley makes a natural reservoir for this purpose. This impounded water is then to be carried through the Wasatch Mountains by means of a tunnel. This tunnel will be sandstone all the way, a distance of 20,000 feet.

THROUGH EVERLASTING HILLS.

By means of this tunnel under the Wasatch Mountains the water is to be conveyed from the Strawberry on the east side of the range and emptied into Diamond Creek on the west side. Diamond Creek is a feeder for Spanish Fork. After the Strawberry water reaches this point it will be diverted by means of canals to irrigate lands now arid or semiarid in the southern part of Utah county.

Some of the land is now partly irrigated by the Spanish Fork, Pason, Santaquin and Hobbie creeks. With the aid of the Strawberry it is estimated that 50,000 acres of highly productive land will be fully irrigated.

Influential in bringing about the favorable action of the general government in this particular project was the Strawberry Valley Water Users' Association of Utah County. Henry Gardner, of Spanish Fork, is at the head of the organization. Others who have played prominent parts are Joseph E. Greer of Lake Shore, Heber C. Jex, Fred Matley and Lars Neilson of Spanish

Fork, William T. Tew of Mapleton, Hyrum Lemmon, J. S. McMath and J. S. Page.

FARMERS GET TOGETHER.

It became necessary for the men holding primary rights to the water in the tract to be irrigated, as well as those holding canal stock and others holding rights to the flood water of the streams, to pool their issues and get into a position where they could treat with the government as one man. They were also obliged to take the water from the Strawberry at so much per acre, approximately \$40 an acre. This was to guarantee the return to the government of the \$1,250,000 expended on the project. All this was accomplished and 1,152 of these farmers in Utah county entered into a contract to do all that was required.

All the preliminary work on the Strawberry Valley project has been under the supervision of George E. Swendsen, who is in local charge of the United States Geological Survey work in Utah. This preliminary work, it is announced, is completed and the local office is prepared to go ahead with the actual construction work without further delay. Cold weather and snow in the mountains may retard operations until spring. It will be three years before the Strawberry water can be spread over the farms of Utah county.

RECLAIM A LITTLE EMPIRE.

Placing the maximum number of acres to be irrigated as the result of this project at 30,000, and placing the maximum value of the land after it is irrigated at \$100, or \$3,000,000 for the whole tract, it will still be seen that Utah is greatly the gainer through the assistance of the general government. Much of the land will be worth far more than \$100 per acre.

All government irrigation projects in Utah other than this of the Strawberry Valley are sidetracked indefinitely. A great amount of survey work has been done by government experts in recent years on the Utah Lake project, the Bear Lake project and the Weber River project. It was the hope and expectation that these projects could be carried along parallel lines, and that in this way a large majority of the population of the State could be made the beneficiaries of government aid in the working out of projects that are too large for private enterprise.

It was conceded that the Utah Lake project would benefit a greater number than any other project in the West for a like expenditure of money. Converting the lake into a great reservoir for the impounding of the flood water of the streams flowing into it was pronounced feasible by the government experts. It was demonstrated that this additional water would irrigate a magnificent tract of land under the lake. The possibilities appealed to all who considered the scheme, and naturally the residents of this part of the State were enthusiastic for it. The work of combining the farmers and others who held primary rights into an association to deal with the government was well along when the word came down the line that the whole project had been abandoned for the time being.

The excuse given for this change of front was that there had been such heavy drafts upon the government reclamation fund by other states and territories that no large projects could be taken up in Utah until the reclamation fund was restored by the sale of land. Thus the matter stands.

FARM MACHINERY INVESTIGATIONS.

Address by Prof. C. J. Zintheo Before the N. A. I. and V. M.

WHAT MODERN MACHINERY SAVES.

(CONCLUDED.)

To be sure, all responsible implement manufacturers have their own experimental departments, in which more or less care is exercised in the development of machines and the improvement of the parts. It often happens that the men who are doing this work have a great many other duties to perform and consequently the experimental work is not as thorough as it might be. But even with the best of care exercised by such departments, the judgment passed upon the machines is only from the manufacturer's and not from the farmer's standpoint. If the perfected machines were sent to some implement experiment station, and there subjected to thorough scientific and impartial tests from the buyer's standpoint, and compared with similar machines of other makes, these tests would probably save the manufacturers thousands of dollars. Cases are perhaps familiar to most of you, where incorrectly designed machines put on the market in large numbers have almost ruined the manufacturers.

It is hoped that the courses of farm mechanics in the colleges will develop into departments of agricultural engineering, from which implement manufacturers may obtain graduates trained in agriculture and mechanical work, who will make valuable employes in their experimental departments. The men now employed in designing and implement experimentation were often trained for something else, as at present there are no schools of training in this country for agricultural engineers. For this reason these men are often lacking in either the necessary agricultural or mechanical training, and as the implement manufacturers have to rely to a large extent upon their experimental departments, it is exceedingly important that these men should not lack either of these lines of training.

It may be advisable to refer to some of the lines of farm machinery investigation which the Office of Experiment Stations of the Department of Agriculture is planning to conduct in the near future.

The grain harvesting machinery practically reached its present state of perfection about fifteen years ago, and a bulletin on the development of the reaper has been issued by the Office of Experiment Stations.

Owing to the more difficult problems to be solved in harvesting corn by machinery, implements for this purpose have only come into use during the last fifteen years. There are now numerous corn binders, shockers, pickers, huskers and shredders on the market, which have materially aided the farmers. A valuable field of investigation will be to trace the development of these machines and to learn just what saving the investment in the various corn harvesting machines will be to the farmer, or what interest he will make on his investment; the amount of work which can be done per day, as well as the efficiency, durability and draft of the machines.

The corn planter is still in a stage of development and broad claims are made for both the edge drop and round hole plate methods of dropping the corn kernels. From experiments already conducted, it has been learned that this is a fruitful field for investigation by the Ex-

periment Stations. Letters have been received from corn planter manufacturers, stating that they have improved the accuracy of the drop over twenty per cent, by following the suggestions offered by the experimenters on their planter. It was found that the edge drop planter would do more accurate work by grading the corn kernels into uniform sizes. This is a tedious work to do by hand and the attention of manufacturers of fanning mills was called to the need of a corn grading machine. Several firms made attempts to construct such a machine, with the result that three machines were produced, working on entirely different principles, one of which will grade corn more accurately into uniform sizes than can possibly be done by hand. To realize the importance of these experiments it is only necessary to state that by the use of corn planters that will drop the corn uniformly, a predetermined number of kernels per hill, the yield of corn per acre can easily be increased twenty per cent. This increase in yield would in a single year more than pay for all the corn planters made.

The manure spreader has in recent years been added to the list of implements sold by the majority of implement dealers. In some localities their introduction is not making much headway, for the reason that it is hard to convince farmers, and especially tenant farmers, that the price paid for a manure spreader is a profitable investment. Experiments conducted to determine the time saved by the use of the manure spreader, the advantages of its use over the hand method and the interest which the farmer may expect to make on his investment, will certainly be both timely and valuable.

The subject of grain drills has never been adequately investigated. Drills are now made in a great many ways, such as single disc, double disc, shoe and hoe drills; and the rows are planted six, seven, eight and ten inches apart. Which of these kinds of drills can be used to the best advantage in the various sections of the country is still an open question, as no experiments have been conducted to accurately determine which will produce the best yield and the lightest draft. We hope to conduct experiments which will answer these questions.

In threshing small grain with our modern threshing machine, it is claimed by those who have studied the subject that the loss through improper separation, due to ignorance in the handling of the machines or to improper designs, amounts to nearly one bushel per acre, on the average. This loss would amount to over 8,000,000 bushels for a single state in which wheat is the principle crop raised. We hope to determine just what the loss from this source is, and through suggestive changes in the separators, reduce it to a minimum.

The disc plow has been introduced in the last few years and is claimed by some manufacturers to be suitable in any soil; by others, to be adapted to only certain localities; and by still others, to be in no case equal to the moldboard plow. A fruitful field will be the investigation of the merits of the disc plow compared with the moldboard plow, in co-operation with experiment stations and farmers, to compare the draft, efficiency of work, and yield per acre when using disc and moldboard plows in various sections of the country, and thus try to answer the questions often asked by farmers as to when and where to use the disc plow or the moldboard plow.

The semi-arid region of the West, which comprises about one-fourth of our agricultural domain, is still of very little value for farming purposes. Much of this land will be brought under irrigation and new varieties of farm implements will be needed to cultivate the crops on these lands. There will still remain large areas which will be devoted to dry farming. New drought-resisting varieties of grain are being introduced into those sections and special implements, entirely unknown in the East, are being used for the conservation of moisture in the soil.

We are now co-operating with the experiment stations in that section and with the Union Pacific, Northern Pacific and Great Northern railroads in tests of tools for conserving the moisture in the soil and utilizing all the available rainfall for the production of crops. The implements used in these experiments will be carefully investigated and we hope to be of assistance to both the farmers and implement manufacturers in determining what methods and implements to use in the soil cultivation in these sections.

The traction engine is now being introduced on the large farms of the western states to take the place of horses for plowing, cultivating and seeding. No accurate investigations have as yet been made to determine the efficiency of this method of soil cultivation or the comparative cost between the use of horses and other forms of motive power for the farm. We hope to be able to investigate the subject so that both the farmers and manufacturers may know when and where traction engines can be economically employed for farm cultivation.

The windmill has been used for years for pumping purposes on the American farm, but for other power purposes it is hardly built strong enough to be of much value. There is an enormous amount of energy going to waste with the movement of the wind, which in the semi-arid region of the West could be utilized in pumping water for irrigation. If suitable windmills were constructed to utilize the full power of the wind. In order to do this it will be necessary to invent some automatic arrangement which will vary the length of the stroke of the piston with the velocity of the wind. We are now experimenting with several different makes of windmills in the western states to determine what can be done with windmill irrigation.

The subject of power for the American farm is now in the transition period. Where formerly all the farm work was done by the horses and an occasional windmill for pumping water, the gasoline engine is now finding rapid favor as a farm motor, and its usefulness can be greatly extended in doing much of the disagreeable work on the farm. The farmers need information on methods of installing their power plants, so that they may use these motors economically and to the best advantage.

Numerous and conflicting statements are made as to the amount of gasoline used per horse-power hour, and no definite information from actual tests is available, from which the users of these engines may know the cost producing power. An investigation of this subject will be of great value both for the farmer and the manufacturers. With the introduction of the gasoline engine comes the increase in cost of gasoline to almost double the price of a few years ago, and the producers claim that the demand will soon exceed the supply. It is, therefore, of the utmost importance to find some other fuel to take the place of gasoline in internal com-

bustion engines. Germany has investigated this problem to the great advantage of her farmers.

"Germany has no natural gas wells or native petroleum supply. When some years ago the question of adopting motor carriages for military purposes was under discussion it was remarked by the officials of the War Department that kerosene and gasoline could only be operated with one or the other of the products of petroleum, which is not produced in Germany, and the supply of which might, in case of war, be wholly cut off. But the broad sandy plains of northern Germany produce in ordinary years cheap and abundant crops of potatoes, from which is easily manufactured, by processes so simple as to be within the capacity of every farmer, a vast quantity of raw alcohol. German inventors and scientists have been busy with improvements in the processes of machinery and distilleries. New and highly perfected motors, lamps and cooking and heating apparatus have been devised and put into use, until crude alcohol is becoming one of the most widely utilized products of German industry." The German government has encouraged this industry in every way possible and has removed all taxes from alcohol used for technical purposes. The alcohol has been produced in Germany for 13 cents per gallon and with very slight changes can be utilized in the ordinary gasoline engine in place of gasoline.

We hope to conduct experiments in co-operation with gas engine manufacturers to determine just what changes are necessary in the present gasoline engines to adapt them to the use of alcohol as a source of motive power. Also to learn at what price per gallon the alcohol can be manufactured in this country from the waste materials on the farm, such as small and unsalable potatoes, poor grades of corn and barley, and even waste cornstalks, beet pulp and sawdust. There is no question but that alcohol can be used as a substitute for gasoline for various purposes. nor is there any doubt but that a great many of the products of the farm now wasted can be utilized for the production of alcohol.

The introduction of alcohol for technical purposes and its manufacture from the products of the American farms will open up new fields of labor. The farm houses will have all the modern improvements of city homes. They will be lighted by alcohol, the farmer's wife will cook the food without much labor and the farmer will be able to apply this source of power to a great number of the drudgeries of the farm and perhaps do his general farm work with alcohol motors instead of horses. In order that this may be accomplished, it will be necessary to remove the tax from alcohol used for technical purposes, as the revenue tax is now nearly fourteen times the cost of manufacture. A bill for the removal of this tax was introduced at the last session of Congress by Congressman Charles S. Boutell, of Chicago.

We also expect to experiment with gas producer gas engines, using lignite coal, which is found in such abundance in North Dakota, where large irrigation projects are now under way and where it will be necessary to pump water for irrigation. Lignite coal seems to contain a greater percentage of gas than other coal. If a cheap power can be found for pumping in irrigation, for manufacturing and agricultural purposes in the western country, it will cause great changes in its development, and it will support millions of people where now an occasional cowboy is the sole inhabitant.

It will thus be noticed that the Farm Machinery

Investigations of the Office of Experiment Stations of the Department of Agriculture have a large sphere of usefulness and they may be of great service both to the farmers and farm implement manufacturers by conducting these experiments in an impartial way, by preparing useful information for the benefit of the farmers, and by offering friendly suggestions to the manufacturers.

In order that we may accomplish the best results, it is absolutely necessary that a spirit of friendly co-operation exist between the implement manufacturers and the Department of Agriculture.

One of the reasons why we appear before the members of this Association is that a correct idea of the scope of our work may be known to you from the beginning, in order that we may have your confidence and support.

Another matter that is merely suggestive for the consideration of this Association is the establishment of an agricultural implement museum and exhibit building in Washington, similar to those now existing in Berlin, Paris, Moscow and St. Petersburg. Such a collection would be of immense educational value, not only to our own people, but to the numerous foreigners who annually visit our national capital. It would also be the means of preserving the handiwork of the American inventors of farm implements who have done more for the development of this country than any other class of men, and who should surely rank in the honor and esteem of future generations with our famous statesmen, generals and authors.

But the collection of such an exhibit would be of

still greater value to the present generations, in that it would afford an opportunity for domestic and foreign purchasers of agricultural implements to study the types of implements manufactured, to make a comparison between the different makes of the same type, and to decide what ones would best meet the requirements of their particular locality. It is the opinion of the authorities in charge of the foreign implement museums referred to that these exhibits have done more for the introduction of modern implements in those countries than all other efforts combined.

If it should seem advisable to establish such an exhibit it could only be done successfully by the co-operation of the American Association of Implement and Vehicle Manufacturers with the United States government. I hope that the best of "community of interest" spirit may always exist between this Association and the Department of Agriculture, and I thank you for your kind attention.

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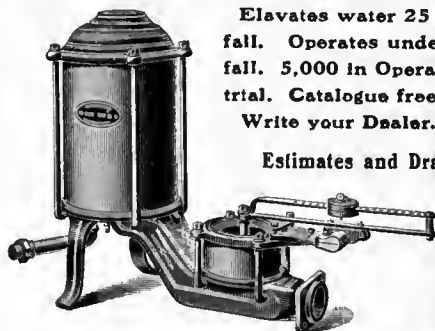
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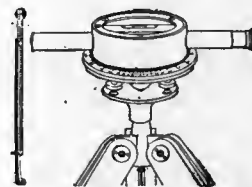
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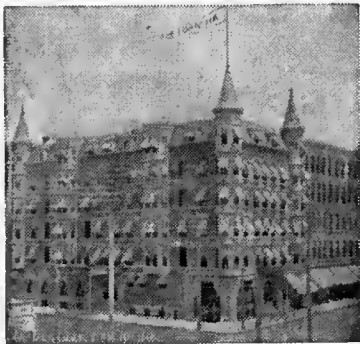
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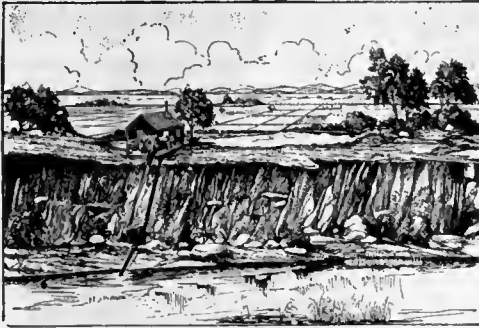
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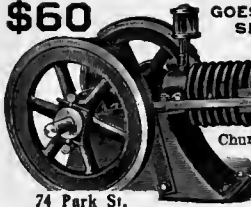


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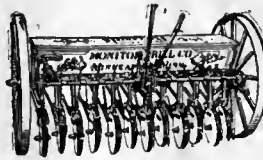


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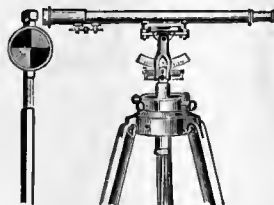
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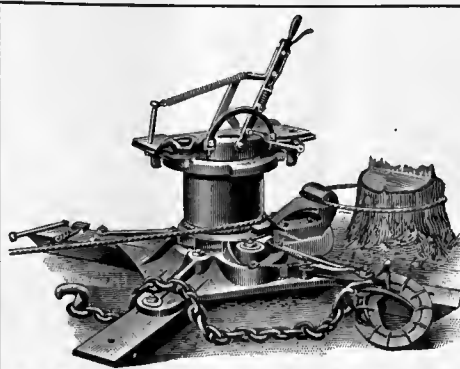
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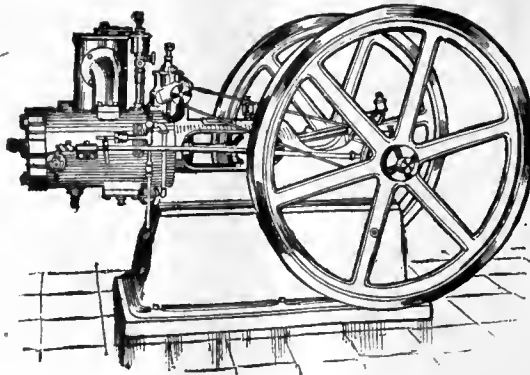
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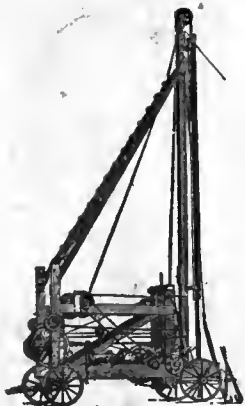
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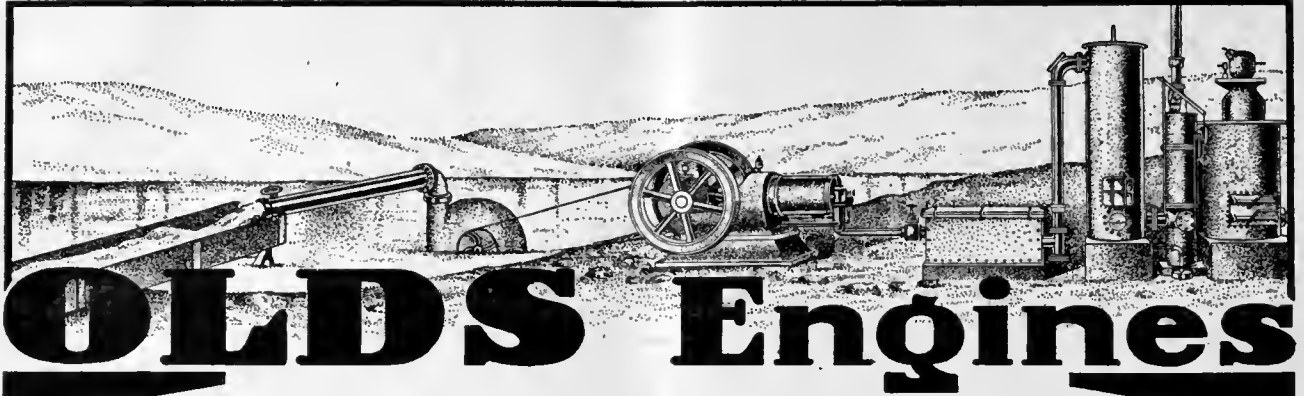
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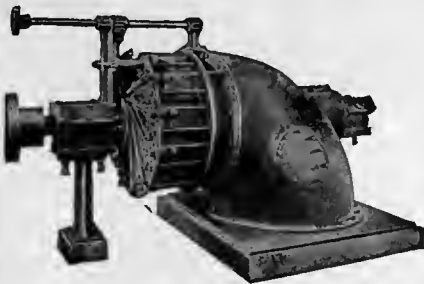
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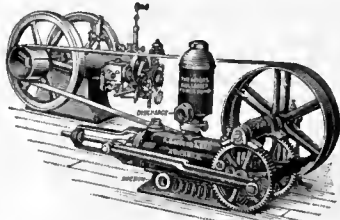
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STROKE

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FIG. 1113

2½" DISCHARGE



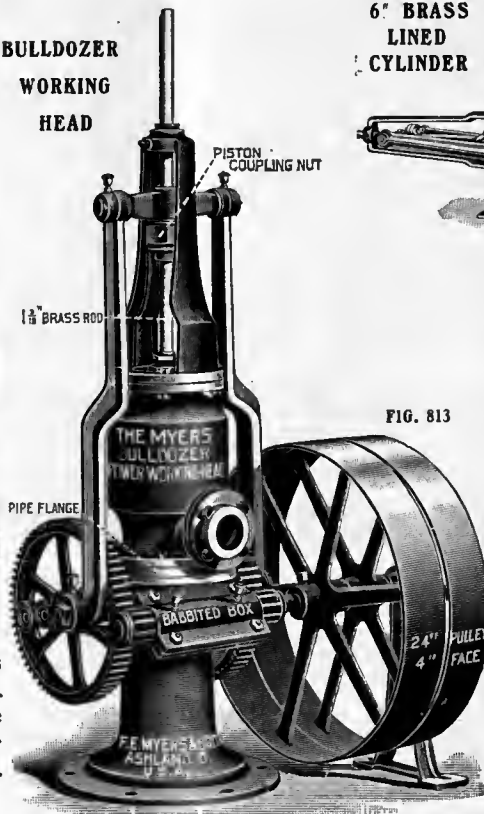
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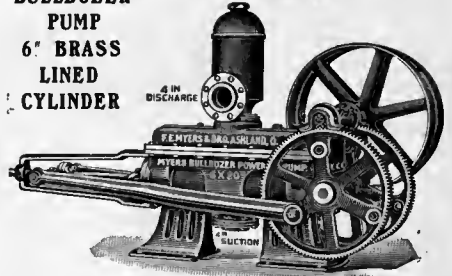
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PUMP
6" BRASS
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FIG. 1079



MYERS BULLDOZER
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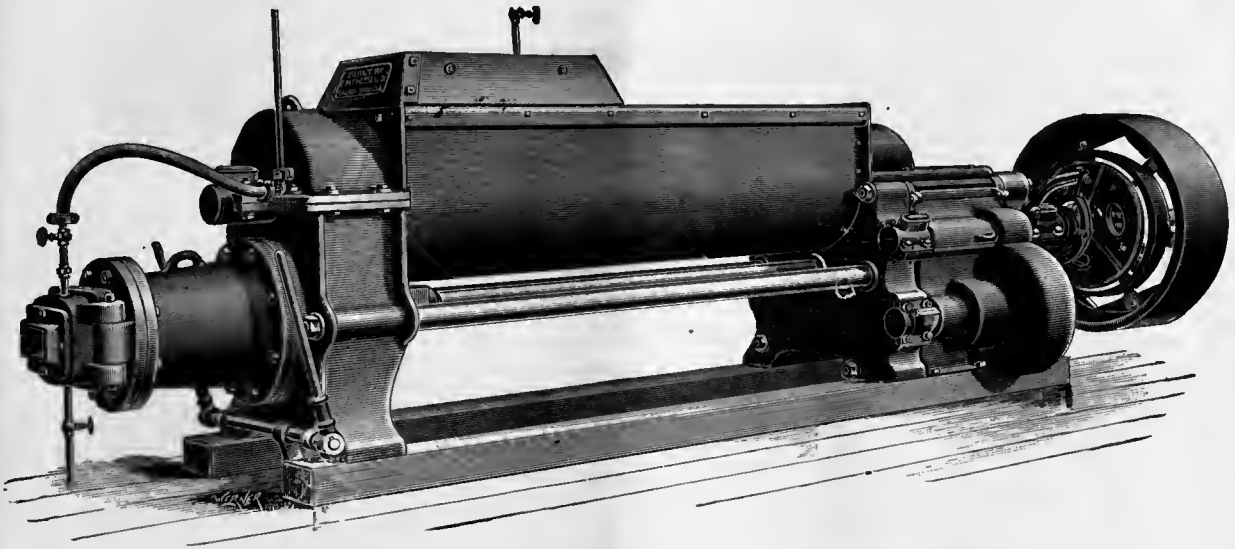
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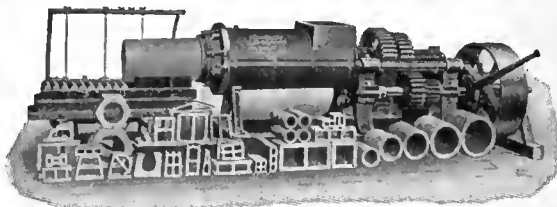


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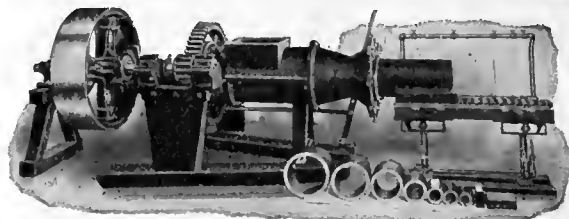
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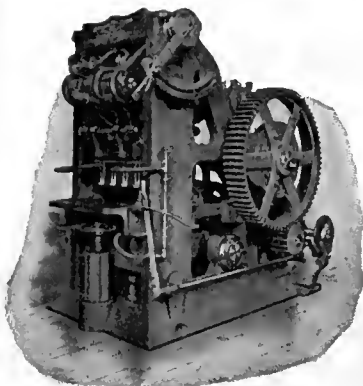
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Centennial Auger Machine



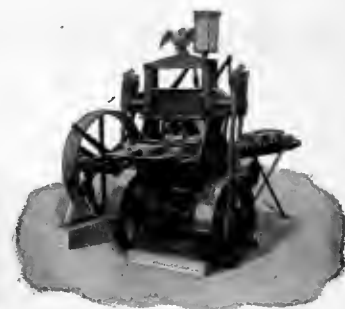
Mascot Auger Machine



Dry Press, 5 styles



Wheelbarrows and Trucks



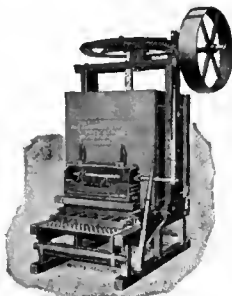
Eagle Repress



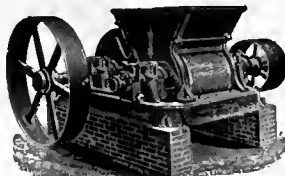
Dry Cars, all kinds



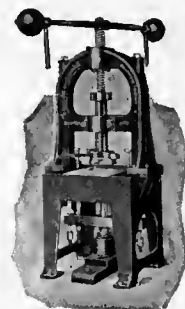
Hand and Power Cutters



Soft Mud Machines, Horse and Steam Power



Disintegrators



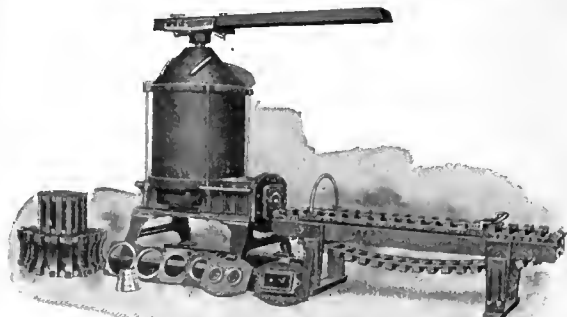
Hand Power Screw Press

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Horse Power Plunger Machine



Products of our Auger Machines

THE IRRIGATION AGE

VOL. XXI

CHICAGO, JULY, 1906.

No. 9

THE IRRIGATION AGE

With which is Merged
MODERN IRRIGATION THE DRAINAGE JOURNAL
THE IRRIGATION ERA MID-WEST
ARID AMERICA THE FARM HERALD

THE D. H. ANDERSON PUBLISHING CO.,
PUBLISHERS,

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D. H. ANDERSON, Editor
W. J. ANDERSON .. G. L. SHUMWAY
Associate Editors

ANNOUNCEMENT.

"The Primer of Irrigation" is now ready for delivery. Price, \$2.00. If ordered in connection with subscription, the price is \$1.50.

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Official organ of the American Irrigation Federation.
Office of the Secretary, 309 Boyce Building, Chicago.

Interesting to Advertisers.

It may interest advertisers to know that *The Irrigation Age* is the only publication in the world having an actual paid in advance circulation among individual irrigators and large irrigation corporations. It is read regularly by all interested in this subject and has readers in all parts of the world. *The Irrigation Age* is 21 years old and is the pioneer publication of its class in the world.

Demand for Engineers. The inauguration of many large engineering works at this time, such as the National reclamation projects, the Panama Canal, and the New York Barge Canal, and the unusual amount of railroad building has so stimulated the demand for engineers that it is found difficult to hold good men at the salaries the Reclamation Service is now paying.

About forty engineers of various grades have resigned from the bureau during the last year, and a similar number have requested furloughs, nearly all of these being on account of railroad or other organizations. The emoluments of a Government position are seldom commensurate with the value of the services rendered by the engineering profession, and but for the magnitude of the works projected by the Government and the opportunities offered to obtain distinction in their construction, few engineers of ability would seek these positions.

The regulations do not permit the engineers to accept outside work, even in an advisory capacity, a privilege which is not denied other members of the profession, and from which they are able to add materially to their salaries. In the matter of subsistence and other expenses the Government is not as liberal as other employers, and it is not to be wondered at that Uncle Sam is losing a large number of skilled and experienced men, whose services are greatly needed. The gravity of the situation is appreciated, and is giving the Department much concern.

Soil Inoculation. The great importance of leguminous crops in maintaining and increasing the fertility of soils was long ago shown to be due to the nitrogen-fixing power of certain bacteria which gain entrance to and live in legume roots. It is now generally recognized that without these bacteria, legumes, like other crops, exhaust the soil of nitrogen. It is thus a matter of the greatest importance in the cultivation of these crops that the proper bacteria be present in the soil under conditions favorable for their development. The old method of inoculating soils is not only expensive, but there is very great danger of spreading weeds and destructive crop diseases at the same time.

Investigators in America, as well as in Europe, appreciate the great importance of securing nitrogen-fixing bacteria in pure cultures for distribution, and it remained for Dr. George T. Moore to perfect a pure culture method of distribution.

In the course of his investigations Dr. Moore soon discovered why it was that the former methods of culture and distribution were so uncertain in their results. He worked out improved methods of making the cultures and increasing by growth in non-nitrogenous media the nitrogen-fixing power of the organisms, and perfected a method of drying them by which their activity can be preserved indefinitely. These processes have been patented by the Department in the name of Dr. Moore for the purpose of protecting them for the use of the general public.

It is now possible as a result of this work to inoculate at very small expense the seed of all leguminous plants which it may be desirable to cultivate. Bacteria for various legumes were distributed during the past year to a very large number of applicants scattered in nearly every section of this country and in many foreign countries. The results obtained have, as a whole, been extremely satisfactory. While investigation in connection with legumes is at present the most important phase of the work, careful attention is also being given to nitrogen-fixing bacteria which occur in connection with other plants, and especially those forms which live independently of special plants.

Agriculture is the most ancient, the most **Modern Farm** universal, and the most important of all **Machines.** industries. It is an industry which rests

upon the combined experience of all previous generations. A complete history of agriculture would be the true history of mankind. It began in prehistoric times when primitive man began to select particular plants in his immediate environment as preferable to others for his use as food and clothing. Some rude attempt at civilization was made by the aboriginal tribes. The primitive hoe was formed of two forked sticks joined by a strip of leather. The plow was a larger implement of the same kind. Among the tribes of North American Indians in early ages the great burden of agricultural labor was thrown upon the women, the men being engaged in warfare. The same thing is true to a great extent at the present time on the continent of Europe, especially in Germany, where the maintenance of such vast standing armies may demand, for military service, every able-bodied man in a district.

Gradually the American people advanced in agricultural science. They employed capital as well as energy and active enterprise in their business. More systematic practices began to prevail. A provision was made for rotation of crops, and other signs of a growing wisdom and thoughtfulness became apparent. During the Nineteenth century the progress of agriculture was profoundly affected by several great general causes:

1. The application of science to the improvement of agriculture.

2. The marvelous changes wrought in transportation methods through the use of steam power on land and sea.

3. Developments of irrigation, making possible the rapid opening for settlement of vast areas of fertile and cheap lands offered by the Government and by railroads.

4. The wide dissemination of agricultural information through books, journals, public documents, farmers' institutes, etc.

5. The establishment of experiment stations where scientific and practical investigations are carried on for the benefit of agriculture. In connection with this may be mentioned the inspection of material, the investigation of the enemies and diseases of plants and animals, and the dissemination of information on the theory and practice of agriculture. Climatic conditions are investigated. Soils are analyzed, their geology, physics, and chemistry determined. Their improvement and conditions under which they can be used most advantageously are considered.

6. The establishment of governmental agencies for the promotion of agriculture and the specialization of agricultural industries.

7. The voluntary co-operation of farmers through numerous associations.

8. And most important of all, the invention and extensive use of labor-saving machines as applied to agriculture. Until recent times, little effort was made to introduce farm machines, owing to popular prejudice, but in later years the rapid settlement of Government lands brought into cultivation vast areas of productive soil. Invention was further stimulated by the rich reward for agricultural products and the high price of human labor. Besides this, increased manufactures called for additional agricultural production to supply raw materials.

Today the United States is remarkable for the value and number of its farm machines and implements. It exceeds all other countries in its wonderful machines for the cultivation and harvesting of crops. Nearly every operation of the farm has been made less burdensome, and many methods of agriculture have been completely transformed. Seed sowers, cultivators, corn binders, small grain binders, and steam threshers and other similar machines have made it possible for one man to accomplish the work which it would have required twenty men to perform a generation ago. Steam has not yet come into general use as a motive power on the farm. Probably it is in more common use in Southern California and other Western states at the present time than in any other section, being used to propel the immense tractors used there. But viewing the situation from an economical standpoint, the Eastern farmers seem to prefer horse-power. In fact, it would be impossible to grow the agricultural products of the United States with our present population were it not for farm machines. Of the world's wheat crop, the United States produces one-fifth, three-fourths of the corn and more than one-half the cotton. As nearly as can be computed with the authentic figures available, more than 1,000,000 harvesting machines, including binders, mowers, reapers, headers, hay rakes, corn binders and huskers and shredders are annually manufactured in the United States.

Notice the contrast between the two methods. Originally the heavy, clumsy plow was used, the seed sown by hand, harrowed into the ground by the drawing of bushes over it, the grain cut with sickles, hauled to a barn and some time before the following spring was threshed with flails; the winnowing was done with a sheet attached to rods on which the grain was placed with a shovel, then tossed up and down by two men until the wind had blown out the chaff. Now, on the contrary, the ground is plowed, pulverized with a harrow, the seed sown with a mechanical seeder drawn by horses, the reaping, threshing and sacking of the wheat are done with the binder and thresher, the latter being operated by steam, and then the wheat is ready to haul to the granary or to market. Corn also is planted, cultivated, harvested, husked and shredded by machines. Hay, potatoes and all other farm products, except cotton, are grown and handled in a similar way. Hence farming has become a science requiring as much ability—knowledge and skill—as any of the so-called “higher professions.”

\$2.50 will secure for you one year's subscription to THE IRRIGATION AGE and a finely bound volume of the Primer of Irrigation which will be sent postpaid in a few months, when volume is completed. The Primer of Irrigation will be finely illustrated and will contain about 300 pages. Send post office or express money order for \$2.50 and secure copy of first edition.

AN objection to federal control of the range arises in sections sixteen and thirty-six of each township, which are school lands belonging to the school property of various states. Extensive forest reserves embracing whole townships naturally must include these isolated sections, nearly all of which are now leased and contributing a revenue to support public schools.

THE leases on school land, adaptable only for grazing, will lapse immediately when surrounding territory is included in forest reserves. Heretofore they have been the keys to wider areas, but if the rates established by the Forestry Department are extended it will be an inducement for cattle owners to abandon school section leaseholds and contribute to the national fund.

THIS policy of robbing school children with forest reserves has heretofore been applied only by skinning timber from whole townships of unsurveyed lands (which would include sections 16 and 36 if surveyed) by order and sale of the forestry service. Protests against the practice have been unavailing, but that does not deter us from entering a more vigorous effort to prevent extensions of the policy, unless the obliterated revenues from school land leases is made good by the national government.

FEDERAL policies as executed by Messrs. Newell and Pinchot involve interpretations that menace the school fund all over the West. Mr. Newell's part consists of his insistence upon school land under federal irrigation projects passing from state to private ownership. In some Western states, statutes exist which forbid such transfer—school lands being in the nature of a permanent investment of school funds.

TO COMPEL an alteration of state law, that these lands shall be sold, forces school children to part with a most valuable asset and revenue producer—and forest reserve extension obliterates revenue from inferior lands. *Between the Newell and Pinchot millstones may be found a basis for increased illiteracy.*

IF THIS condition is resultant of design, the heads of reclamation and forestry divisions are filled with infamous purpose. If produced by accident of inexorable law, these individuals could well spend time in working out a remedy. Neither has shown any inclination, save to extend their processes of absorption.

OUR remedy would be: if forest reserves are made to include school lands, that the federal government reimburse for all leases, which are made inoperative by reason of said action. In reclaimed areas, by national legislation or ruling of the honorable secretary, extend water privileges upon leaseholds (while observing the land unit if necessary) and make the charges a lien upon the lease, and all improvements and product.

OUR nation's executive, from his resources and

knowledge, could without doubt evolve a plan of justice and equity which will solve the range problem. Congressional opinion is chaotic and needs virile initiation to crystallize it. The President has wisely observed that the wide variety of conditions will compel a classification of lands to arrive at an adequate and just solution.

THE bureaucratic inclinations of Mr. Pinchot, and his ability to involve cumbering processes, and his lack of quick executive perception, taken together with urgent necessity and impending calamity to the cattle industry, inspires an opinion that the work of classification, and control of the range be vested in a new department under the Secretary of Agriculture. With accessories such as Forest King Pinchot's operations usually attach, little or no residue would remain for experimental work.

THE letter quoted from last month, addressed to Mr. Anderson and from a gentleman connected with the reclamation service, says: "Precedent and regulation rule in departmental matters, and we are constrained to act in accordance therewith." Why precedent? Does precedent build republics, or deter our able President when executive action is required? The National Irrigation Act, and every step in progress, shatters the old fossilized ideas of precedent. A sheep can follow, but these times need men to initiate.

IF THE reclamation service realizes the "big task that confronts," if it would have the co-operation of everyone interested in the upbuilding of our Western empire, as the letter states, why are sinecures retained in service?

THE area of unreclaimed lands is approximately 850,000,000 acres. In other words, there are more than ten acres for every man, woman and child in the United States. Moreover, this item is not so diminutive but what everybody can see it—if they sit up and take any notice at all.

ON ANOTHER page we reproduce the text of a bill recently introduced in the House of Representatives by Congressman Steenerson of Minnesota. This bill provides for a report to be made by the Secretary of Agriculture, and also gives proper recognition to the importance of drainage and the value of the Agricultural Department's work in promoting the best interests of irrigation. We think some of the provisions in the bill are indispensable, and that the bill as a whole should receive the unqualified support of all who wish to place this important work in the right hands.

AGRICULTURE is the noblest employment of man, and is the true source of a nation's prosperity and independence, for it promotes manufacture, stimulates commerce and creates wealth. Whatever, therefore, tends to foster and enlarge agriculture must of necessity prove a public blessing. Irrigation does all of this in larger measure perhaps than any other one thing—and hence whatever tends to promote the growth of irrigation should be given cordial and substantial support.

IRRIGATION opens up the new lands and blazes the way for railroads, towns, and all the complex ramifications of modern civilization that quickly follow.

BREAD is foremost among the necessities of life. The marvelous production of breadstuffs is what has placed the United States in the very forefront of the world's greatest powers.

FREE alcohol will insure a good market for many of the waste products of western farms.

MESQUITE and sage brush, under the benign influence of irrigation, are giving way to wheat fields, gardens, and prosperous, happy American homes.

SOME of the new lands recently brought under cultivation by means of irrigation have been found to be exceedingly fertile, the yields surpassing those of the rich prairie lands in the middle west.

MANY millions of acres of good land are yet to be reclaimed by irrigation—and to do this great work a large force of workmen will be required. Tools, machines and equipment will also be needed.

THE first regular meeting of The American Irrigation Federation will be held in Boise, Idaho, September 2, at the Idanha Rotel. The date fixed for this meeting (September 2) is the Sunday preceding the opening of the National Irrigation Congress, which meets at Boise, September 3-8. The work undertaken by the Federation is now well understood, and there should be a large attendance at the initial meeting. A pressing invitation is extended to all members to be present and bring your friends with you, for a number of important matters will be discussed and acted upon.

ACCORDING to a bulletin issued by the Passenger Department of the Union Pacific Railway, Nebraska will have good crops this year. Following is the estimated yield of the several cereal crops: Wheat, 45,000,000 bushels; rye, 3,000,000 bushels; oats, 2,700,000 bushels; alfalfa, 1,260,000 tons.

The Colorado Experiment Station has issued the following bulletins: "Insects and Insecticides," "Fertilizer Experiments with Sugar Beets," and "Larkspur and Other Poisonous Plants."

A FEW weeks' sojourn in the Rocky Mountains or on the Pacific coast will do one more good than a barrel of medicine—moreover, in traveling to the coast one will find numerous opportunities for making profitable investments.

IN THIS issue we present a number of illustrations showing irrigated lands in Washington and Montana, tributary to the Great Northern Railway. The views shown are: "A Lateral Canal and Land Irrigated by Spokane Canal Co.," "Part of the Canal of the Spokane Co.," "Oats Yielding Seventy-five Bushels per Acre," "Flume of Spokane Canal Co." and "Irrigation Apple Orchard." The illustrations were made from photographs taken by the Passenger Department of the Great Northern Railway, and they show actual scenes along the route.

A contract has been made between the United States and the Buford-Trenton Water Users' Association, a corporation duly organized and existing under the laws of the State of North Dakota. By the terms of this contract the water users' association guarantees the return of the moneys invested by the United States in the construction of the irrigation works of the Buford-Trenton project.

Anyone wishing information about Utah, its resources and opportunities, should procure a copy of "Utah," a new book issued by the passenger department of the Union Pacific Railroad Company, Omaha, Neb. The book comprises more than one hundred pages, and covers a wide range of subjects, including area, agriculture, climate and health, cost of living, dairying, fish culture, horticulture, irrigation, manufacture, minerals, poultry, population, schools, stock raising, timber, railroads, and historical data. A number of valuable tables are also furnished. The little book is of great value not only to people in other States who may desire information concerning Utah and her resources, but also to the residents of the State.

CORRESPONDENCE.

BRAWLEY, CAL., June 7, 1906.

EDITOR IRRIGATION AGE:

In your May issue you discuss "Oppressive Use of Power" at Yuma, Ariz. You kept too close to the Sangineta store to ascertain the facts, or you looked at the Yuma project through smoked glasses. Please go back with a clear pair of glasses and find out what the home seekers have to say; please look without prejudice, and find out what the real users of water think—not what some capitalist thinks.

ROUND ROBIN.

Send \$2.50 for The Irrigation Age
1 year, and The Primer of Irrigation

The Fourteenth National Irrigation Congress.

Program of the Forthcoming Convention at Boise.

Arrangements for the Fourteenth National Irrigation Congress, which convenes in Boise, Idaho, September 3 to 8, inclusive, are being made on a scale commensurate with its importance and the record-breaking number of delegates which will attend the congress.

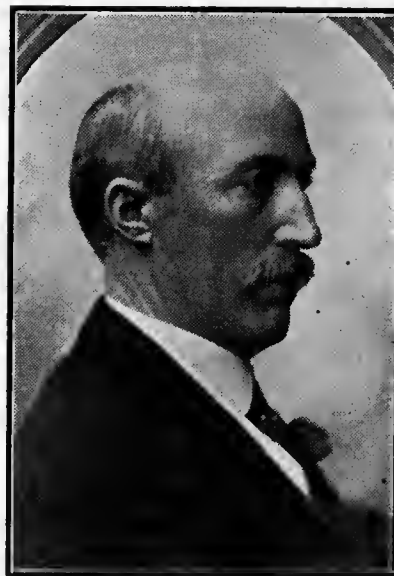
A board of control of local arrangements has been appointed, consisting of the following well-known citizens of Boise: John McMillan, chairman; General Joseph Perrault, secretary; C. C. Anderson, treasurer; C. B. Hurtt, Bishop A. J. Glorieux, Leo P. Grunbaum, J. H. Hutchinson, Edgar Wilson, Montie B. Gwinn and W. T. Booth. The board is providing a fund of \$20,000 with which to entertain the congress, and many attrac-

for all that can ever be produced when all of the irrigable lands of this section of the northwest have been reclaimed. Idaho contains 20,000,000 acres of the best white pine, fir, tamarack, cedar and other valuable timber, in the development of which many mills are being put in operation. Idaho has the largest mineral territory of any State in the Union, and though but scarcely explored, the State is producing one-half the lead output of the United States.

In a building to be erected for that purpose in the park grounds an exposition of the products of irrigation will be conducted, in which sixteen states and territories comprising the irrigated area will compete for



Hon. Geo. C. Pardee,
President of the National Irrigation Congress.



Hon. Montie B. Gwinn,
Chairman Executive Committee, National
Irrigation Congress.

tive features will be carried out for the instruction and entertainment of the delegates.

The sessions of the congress will be held at Riverside Park, Boise's beautiful recreation ground, located on the banks of Boise River, four blocks from the railroad depot, and reached by the electric street car service. The general meetings will be held in the Park theater, a large structure built for summer entertainments. The building is an ideal place for such a convention. Its ceilings are high, the sides are open, affording splendid ventilation, the acoustic properties are perfect, and with a seating capacity for 2,200 gives ample room for the delegates and visitors in a place that will be cool, comfortable and convenient.

A two-story pavilion, 125 by 175 feet, adjoins the theater. The lower floor will be used for a cafe during the congress and on the floor above an industrial exhibit and information bureau showing the resources of the State will be conducted. A mineral display showing the products of the mines of the State and a comprehensive exhibit of Idaho's vast lumbering industries, the development of which will provide a home market

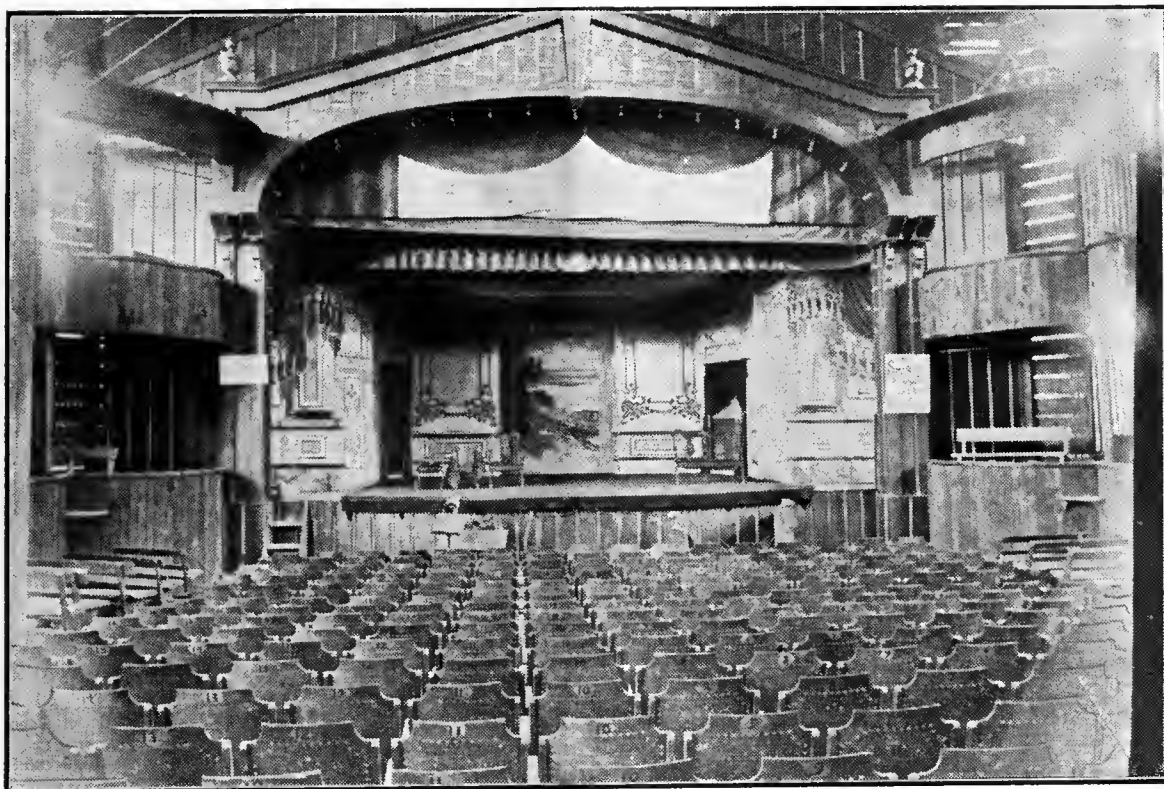
numerous valuable premiums offered for the best state, county, association and individual exhibits of fruits, sugar beets, grains, grasses and other vegetable products. This opportunity will be taken advantage of by the semi-arid states in which to exploit the resources of each, serving as an object lesson to the visitors to the congress of the practical results of irrigation.

Other arrangements made for the congress include the Orpheum theater for the use of the division devoted to engineering. This is a new building located near the park. Lantern slides will be used to illustrate engineering problems in irrigation enterprises, and discussions will engage the attention of prominent engineers of the government reclamation service, the association of State engineers, and other prominent irrigationists. Ample arrangements have been provided for the committees on forestry, climatology, rural settlement and other features of the congress. The program will provide for general sessions of the congress during the forenoons, the afternoons to be devoted to special subjects outlined by the various divisions, in which the delegates generally will take part.

Through the personal efforts of Governor Pardee, president of the congress, governors of twenty-eight States have been heard from, all of whom will be present if public business will permit. Practically the entire membership of the House and Senate committees on irrigation and public lands are coming, and financial institutions in the East, interested in irrigation

The great railroad systems of the West are taking greater interest in the session of the National Irrigation Congress, to be held at Boise, Idaho, September 3 to 8, than any previous convention of that organization, and to insure a large attendance will give the most liberal rates ever offered to the West. Boise is preparing to entertain 2,000 delegates and as many more visitors who will take advantage of the opportunity to study irrigation in a country where agriculture has reached the highest state of perfection.

Vice-President Fairbanks has formally accepted an invitation to attend the Fourteenth National Irrigation Congress, to be held at Boise, Idaho, and will be among the distinguished guests of the Gem state on that occa-



Interior of Riverside Park Theater, Boise, where sessions of Irrigation Congress will be held, Sept. 3d to 8th. Seating Capacity, 2,200.

Boise is preparing to entertain 2,000 delegates at the congress. In addition to ample hotel facilities the citizens will open their homes to the guests, and the sleeping cars bringing the visitors will remain on the side tracks for use of the delegates during the congress.

sion. In accepting the invitation the vice-president wrote as follows: "I appreciate the cordiality of your invitation, and shall arrange to be with you. The subject of irrigation is one that has long engaged my interest. I am in thorough sympathy with every effort made to reclaim the arid and semi-arid lands for cultivation and settlement."

The forthcoming congress will be in the nature of an exposition of the resources of the Northwest. In addition to the exhibit of grains, grasses, fruits and sugar beets, there will be an extensive display of lumbering, as well as an exploitation of the unlimited water power

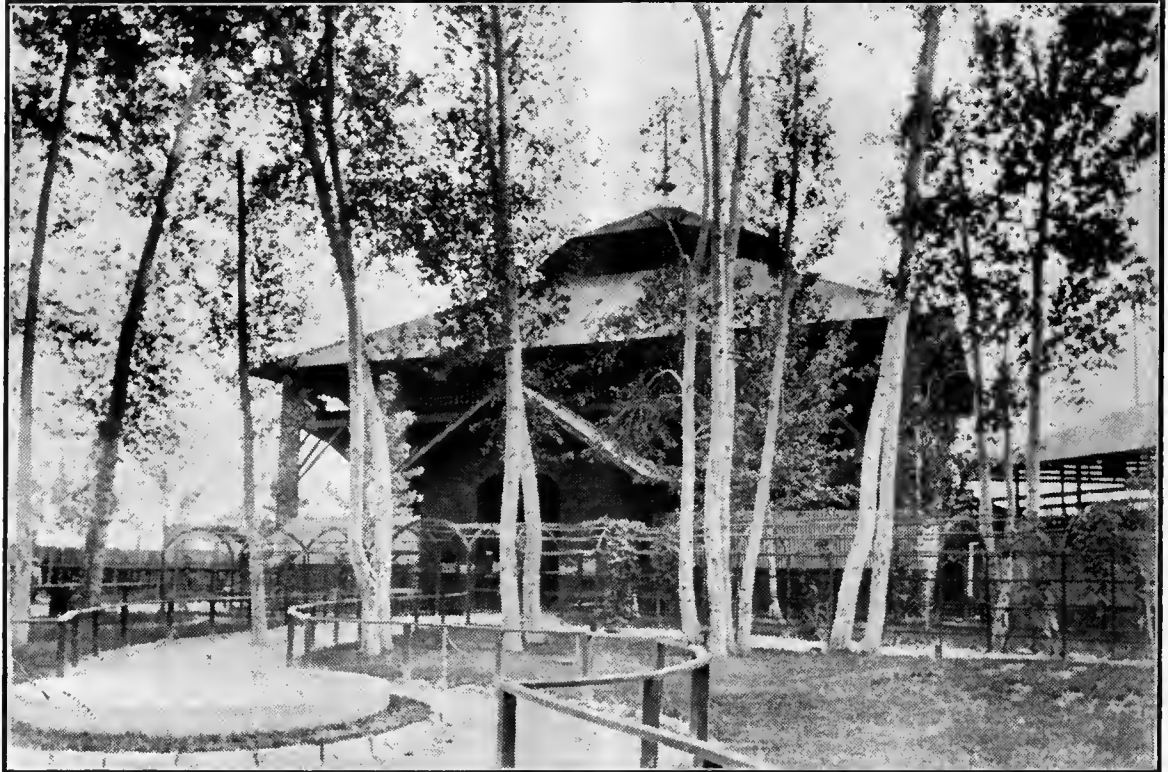
\$2.50 will secure for you one year's subscription to THE IRRIGATION AGE and a finely bound volume of Primer of Irrigation which will be sent postpaid in a few months, when volume is completed. The Primer of Irrigation will be finely illustrated and will contain about 300 pages. Send post office or express money order for \$2.50 and secure copy of first edition.

in the state awaiting development. The congress will be more largely composed of Eastern men who are coming West to learn of the resources of the country than the study of the one question of irrigation, for the subject of market ranks next to that of production. The Boise congress will be a well organized information bureau.

Among the many interesting features is the extensive exhibit of grains, grasses, fruits and sugar beets that will be held. Every state and territory where agriculture is carried on by means of irrigation will compete for the numerous prizes and medals offered for state,

The delegates will have an opportunity of seeing irrigation practiced in a practical way to a better advantage than at any previous congress held. Boise is surrounded by enterprises ranging from small co-operative projects, owned by farmers themselves, to the largest propositions of private capital and government reclamation to be found in the country. The session will be the largest and most interesting ever held.

Boise, Idaho, is well termed "the City Beautiful," owing to the luxuriant growth of vegetation which abounds throughout the city. Every lot in the city



Riverside Park, Boise, where Irrigation Congress will be held, Sept. 8d to 8th, 1906.

county and individual exhibits. Idaho carried off the honors at the Chicago, St. Louis and Portland expositions, and the Ogden Irrigation Congress, and the irrigated sections of the West have served notice that every effort will be made to divide the prizes at the Boise exhibit.

Governor George C. Pardee, of California, president of the National Irrigation Congress, wrote a personal invitation to the governor of each state and territory of the United States, asking them to head the delegations appointed to the congress. Favorable replies have been received from a majority of the chief executives, and those who can not come in person will send personal representatives. A special train of Pullman cars will be made up at Omaha and Kansas City to bring the governors and their parties through to Boise. The Fourteenth Irrigation will be honored by the presence of a larger number of state governors than were assembled since the opening day at the World's Fair at Chicago.

is provided with a water right, which is utilized for the purpose of growing trees, lawn grass, flowers and ornamental shrubbery of all kinds. Delegates will be confronted with object lessons in irrigation from all sides. Texas has a great interest in the result of this congress, for success is expected in the movement started some time ago to have this state included in the benefits derived from the national reclamation of arid lands. It is expected that Texas will send the largest number of delegates of any State represented.

Texas contains a larger area of arid land than any state in the Union. This would all be the most valuable and productive if reclaimed through irrigation. At the meeting of the Irrigation Congress the attention of capitalists will be directed to the great field for profitable investment to be found in this state, through national reclamation and private enterprise.

National Forest Reserves, their creation, management and control, and the policy adopted by the federal government, are subjects that will receive great attention from prominent citizens interested in each side of

these questions. The States of the great Northwest are almost as much interested in the matter of forest reserves as in irrigation, and some lively discussions will be participated in by delegates who will attend the congress for this purpose.

Several hundred delegates from North Idaho, Montana, Wyoming, Utah, Oregon and Washington have advised the executive committee of the National Irri-

districts of the state to show what has been accomplished by irrigation and the new projects under construction.

Irrigation projects costing more than \$30,000,000 are under construction in Idaho. Of these the national reclamation service enterprises will involve an expenditure of \$13,000,000, while the others are being carried on through private enterprise. The meeting will be



High School, Boise.



Columbia Theater, Boise.

gation Congress that they will attend for the purpose of discussing the forest reserve question. Arrangements have been made for giving the advocates and opponents of the policy every opportunity for presenting their views on this important matter, and much is expected to be accomplished. The question is said to be second in importance to that of irrigation.

The citizens of Boise, Idaho, are making great preparations for entertaining the delegates. Riverside

held in the midst of the largest reclamation projects in the Northwest.

The delegates to the Boise meeting of the National Irrigation Congress will be entertained with a plunge party and reception at the Natatorium on the night of their arrival. This is the largest inland bathing



Irrigated Farm Near Boise.



Federal Building.

Park, located but two blocks from the railroad depot, has been secured for the congress. The sessions will be held in the theater, which has a seating capacity of 2,200, while the pavilion adjoining will be used for committee rooms. The buildings are surrounded by large shade trees, and every convenience will be provided for the comfort of the delegates. The exhibits of grains, grasses, fruits and sugar beets promises to be the largest ever held in the Northwest. After the work of the congress has been completed excursion trains will take the delegates to the various irrigated

resort in the United States. The water comes from wells of natural hot water, flowing a million gallons a day, at a temperature of 170 degrees. It is highly mineralized and the baths are very invigorating.

Bids were opened on April 28, 1906, at Garden City, Kansas, for the erection of fifteen steel highway bridges in Comanche county, Oklahoma. After a careful examination of these bids, the Secretary of the Interior has rejected all of them and returned the certified checks to the bidders. The reason for the rejection is that in the opinion of the Secretary they are all unreasonably high. According to a careful comparison, it was found that they range from 36 to 76 per cent higher than the contract prices of similar structures heretofore built in the same county under contract with the Interior Department.

The Secretary does not regard the need for these additional bridges sufficiently urgent to warrant paying excessive prices for the same. This year being a year of remarkable industrial prosperity, materials and labor are high, and as plenty of work can be obtained on comparatively loose specifications, and often on no specifications, the bridge companies apparently are not particular whether or not they do any work for the Government.

Suggestions for the Construction of Small Pumping Plants for Irrigation.

KIND OF WELLS ADAPTED FOR SECURING WATER FROM GRAVELS.

BY F. H. NEWELL, Chief Engineer, U. S. Reclamation Bureau.

The most economical well for securing water in the quantities needed for irrigation is a well from twelve to fifteen inches in diameter, extending into the water-bearing gravels thirty to sixty feet, according to the thickness of the gravels at the place where the well is drilled. Strainers for these wells can be made of slotted galvanized iron. The perforated metal should be placed opposite all the coarse gravels, or at a depth of ten feet below the surface of the water. These strainers can be made by any mechanic by punching one-eighth by 1-inch slots into heavy galvanized iron and then riveting the sheets into cylinders of the proper diameter. The cylinders should be rolled in such a way that the burr made by punching the slots will come on the outside of the finished casing, and so that the slots will be vertical. A much better strainer can be made by purchasing the metal in sheets already perforated. For this purpose steel sheets 48 by 120 inches in dimensions, perforated with hit and miss slots, three-sixteenths by one-inch, and galvanized after the perforations are made, will make ideal strainers. When rolled into cylinders these sheets form a casing about fifteen inches in diam-

eter. In constructing the well the perforated sections should be put in place, one above another, to within about ten feet of the water level; from this depth upward the casing should not be perforated.

AMOUNT OF WATER THAT CAN BE OBTAINED FROM THE WELLS.

Wells constructed as above, in gravels similar to those in the South Platte and Arkansas valleys, will furnish at least one-fourth gallon of water per minute for each square foot of strainer surface in the well, when the water in the well is lowered one foot by pumping. If the water in the well is lowered ten feet by pumping the amount of water recovered should amount to at least ten times as much, or two and one-half gallons per minute per square foot of strainer. If a fifteen-inch well is drilled in good water bearing gravel to a depth of forty feet, the lower thirty feet of which is strainer surface, and if the pump lowers the water in the well ten feet, the amount of water supplied by the well should amount to at least 300 gallons per minute. A careful test of the waterworks at North Platte, Neb., showed that the strainers in the wells were furnishing three-tenths gallon of water per minute per square foot of strainer surface, when the water in the wells was lowered one foot by pumping. The average of eleven pumping plants in the Arkansas valley was 0.33 gallon of water per minute for each square foot of strainer surface, under one foot head.

For small pumping plants a single well of the depth indicated above would probably be sufficient, but if good water bearing gravels do not extend to the requisite depth, it would be necessary to increase the number of wells and connect several of them to the pump.

DISTANCE BETWEEN WELLS.

If it is necessary to construct several wells in order to secure the amount of water required for an irrigation plant, it becomes important to consider the best and most economical arrangement of the wells. Two different methods will be found available for this purpose. If the amount of water required is not greatly in excess of that which can be supplied by a single tubular well, it is often found practicable to construct a large dug well, six to ten feet in diameter, to a depth of five to ten feet below the water level, inserting in the bottom of the dug well several feeders of perforated galvanized iron, as described above. This method has the advantage of permitting the pump that is to recover the water to be submerged in the water of the well. A well of this sort is shown in Fig. 2.

In order to sink a dug well the proper distance below the water level it is necessary to construct a wooden, brick, or concrete crib that will sink as the material is removed from its interior. The crib of the well shown in Fig. 2 is made of wood, and is made larger at the lower than at the upper end to facilitate sinking.

Another method of recovering a large quantity of water is to sink a battery of wells and connect them by



Fig. 1.—Well strainers, made of slotted galvanized iron. These strainers are 15 inches in diameter and 10 feet long, provided with $\frac{1}{8}$ x 1 $\frac{1}{4}$ -inch hit and miss slots, punched before the steel is galvanized. The strainers shown in the diagram were made of No. 18 wire gauge sheet steel.

suction pipe to the pump. This method is adapted to secure a larger supply than the method just mentioned. Three or four, or more wells can be arranged in a straight line, twenty or thirty feet apart, and connected to a pump placed near the center of the row of wells. In the diagram (Fig. 3) will be found an arrangement suitable for a battery of eight to twelve wells. These



Fig. 4.—Measuring weir at pumping plant near Garden City, Kas. At the time the photograph was taken the pumping plant was yielding 200 gallons of water per minute.

wells are arranged in pairs, close together, each pair of wells being forty to sixty feet from the next pair on the same suction line. The object of placing the wells close together in pairs is for the purpose of removing a large amount of the fine sand from the water bearing gravel. This can be done in gravels like those found in the western valleys, by pumping vigorously from one of the pair of wells, and at the same time running clear water into the neighboring well. By this

means it should be possible to clear out all the fine material between the two wells. If the water bearing gravels are of the kind usually found in the river valleys of the western prairies, a pumping plant can be constructed sufficiently large to supply from 2,500 to 3,500 gallons of water per minute without lowering the water more than ten feet. Pumping plants of greater capacity than this will usually not be profitable. A large number of moderate sized plants is more desirable than a few large ones.

KIND OF PUMP.

Probably the most satisfactory pump for use in irrigation is the centrifugal pump. However, there are many kinds of small centrifugal pumps. It does not pay to purchase any but the very best machinery for the pumping of water, as poorly designed machinery soon proves too expensive. The various kinds of pumps differ greatly in this respect. The centrifugal pump used by the irrigator should be of the *enclosed runner* type, provided with self-oiling bearings of the oil ring type. There are several excellent makes of centrifugal pumps on the market, and any of them will do good work if the size and design of the pump fit the conditions under which it must work. The maker of the pump should have full information of all the conditions under which the pump is to be installed. These conditions should include the distance that the pump must discharge the water above its outlet; also the amount of suction or the distance the water must be lifted below the pump inlet. The following points are important to those about to install pumping plants:

1—The efficiency of the centrifugal pump under actual working conditions is higher for the large size pumps than for the small size. Pumps having less than three-inch diameter discharge pipe will show a low efficiency.

2—A centrifugal pump will work better and be more efficient if the suction pipe is as short as possible, relative to the length of the discharge pipe. On this

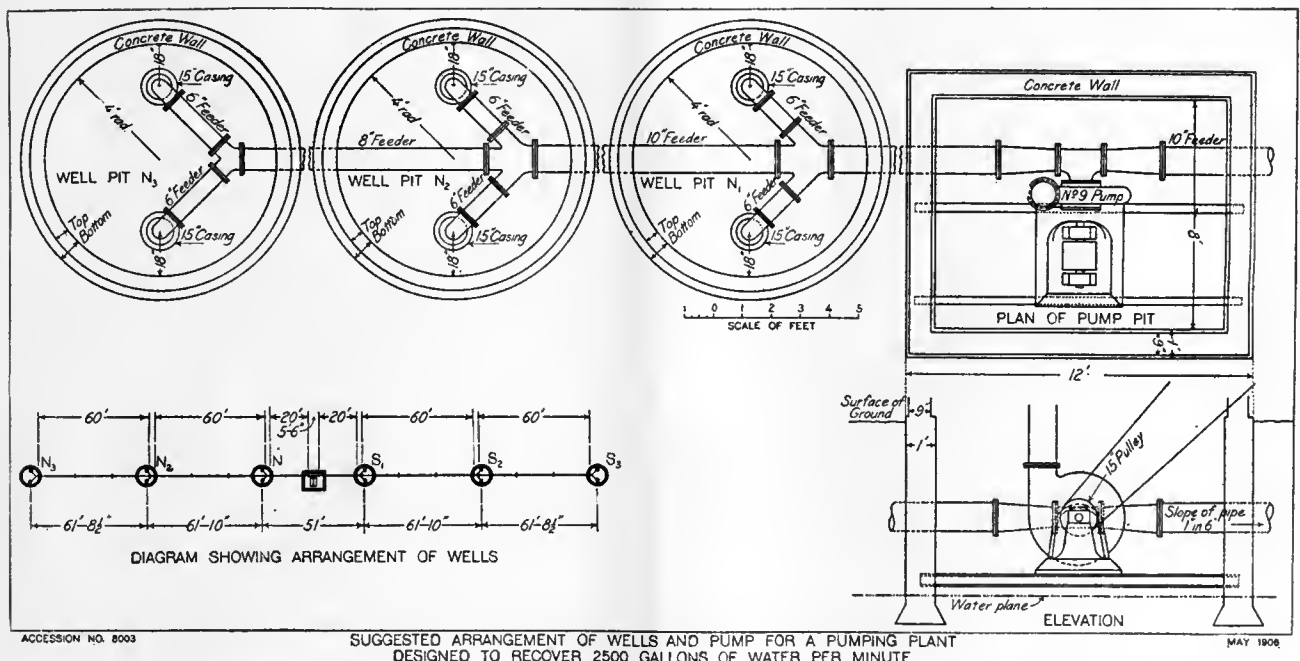


Fig. 3.—Suggested arrangement of wells and pump for a pumping plant designed to recover 2,500 gallons of water per minute. In places where the gravels are deep and unusually coarse, the wells at the end of the line of suction pipe may be omitted. The plant consists of a

central concrete pump house and a group of twelve wells arranged along the suction pipe leading to the pump. The suction pipe should be placed underground as near to the level of the ground water as practicable.

account the pump should be placed as near the level of the water as the securing of a good foundation will permit.

3—If the pump is to be driven by means of a belt it should be provided with a large pulley. The pulley usually supplied with the pumps is so small that a great amount of slipping takes place between the belt and the pulley, and the efficiency of the pump is greatly decreased. Of course it is necessary to secure the proper proportion between the sizes of driving and driven pul-

should gradually increase from four inches at the discharge opening of the pump to eight inches three feet above the discharge opening, and continue this size until the flume or discharge conduit is reached. The discharge pipe can be made of riveted galvanized iron, and the suction pipe can be made either of standard pipe or good well casing.

5—A centrifugal pump loses its efficiency at once if there is an air leak around the stuffing box, or at any place in the suction pipe. Many centrifugal pumps are now provided with a water seal around the stuffing gland that insures the absence of leaks at this point.

A good centrifugal pump with enclosed runner should show an efficiency of about 60 per cent on a thirty-foot lift. Single stage centrifugal pumps, constructed with bronze runners made in two pieces so that the interior could be machined and smoothed, have shown an efficiency of about 80 per cent.

METHOD OF PRIMING PUMPS.

A large number of pumping plants are installed with foot valves at the bottom of the suction pipe. When these are provided a centrifugal pump is always ready to start after it is once primed. The foot valves usually interfere very materially with the flow of water into the pipe, and it is undoubtedly more economical to omit them and place a flap valve at the upper end of the discharge pipe which can be lowered when it is desired to start the pump. An ordinary cast iron house pump connected to the top of the casing of the centrifugal pump can be used to prime the pump with water before starting.

PIPE FITTINGS.

The suction pipe installed by those who construct pumping plants is not only usually too small for the best results, but the elbows and tees used are ordinarily very poorly adapted to the purpose intended. It is a common practice to use steam pipe fittings for this purpose. In consequence the water is required to turn at sharp angles at the tees and elbows, and the best results can not be obtained. In order to avoid this difficulty "long sweep" fittings should be purchased. These are standard trade goods and can be obtained from any of the large dealers in pipe fittings.

SOURCE OF POWER.

A popular source of power for small pumping plants is the gasoline engine. Where the price of gasoline is high it is very easy to make the cost of water prohibitive by the use of such power. Whether or not it pays to pump water by gasoline is a matter which depends very largely upon the distance the water must be lifted, but also upon the kind of crop that is to be irrigated. Gasoline, even at a high price, is usually a cheaper fuel than coal in an ordinary steam engine of small horse power, such as a common traction engine. For plants requiring from twenty to thirty horsepower, producer gas generators can be installed which will keep the cost of pumping down to a minimum. A suction gas producer, using anthracite pea coal for fuel, should furnish power at the rate of one horsepower per hour for each pound and a half of coal consumed. At \$8.00 per ton the cost of coal should be equivalent to gasoline at four to six cents per gallon.

In large plants, requiring from fifty to one hundred horsepower, or more, a condensing Corliss engine is sufficiently economical where the cost of coal does not exceed \$3.50 to \$4.00 per ton.

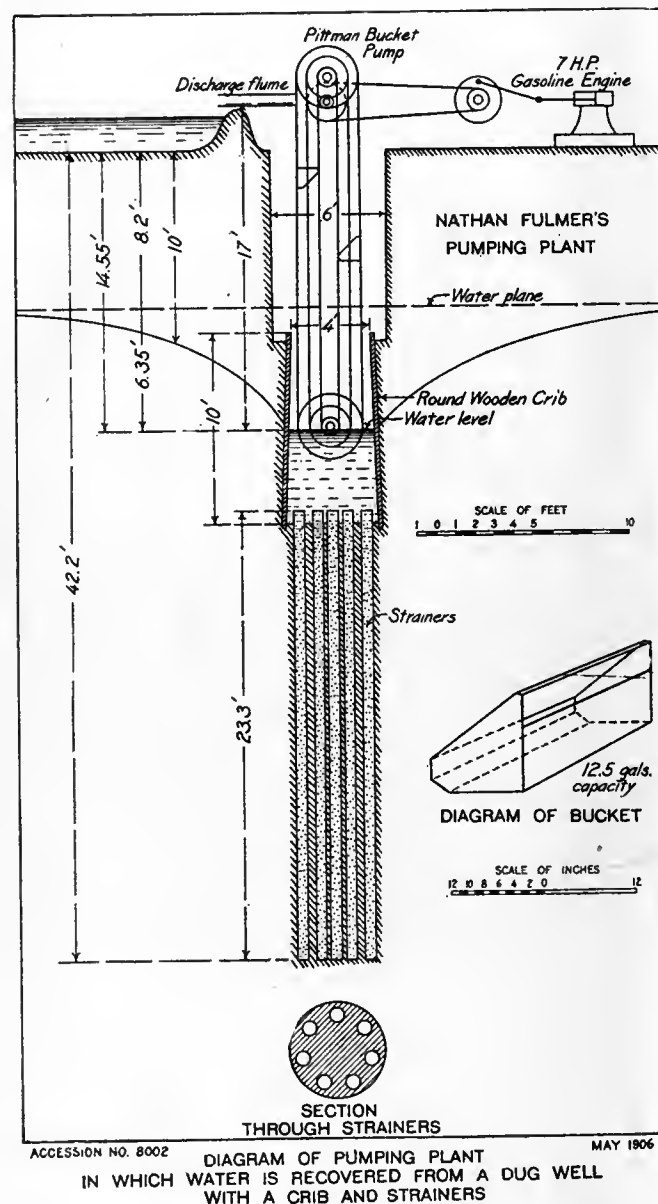


Fig. 2.—Diagram of a pumping plant in the Arkansas Valley, in which the water is recovered from a dug well having a wooden crib, in the bottom of which are placed seven galvanized iron strainers or feeders. A chain and bucket pump is used on this well. Better results would undoubtedly be obtained by using a vertical shaft centrifugal pump submerged in the open well.

leys, but both should be larger than are usually furnished with pumps and engines.

4—The suction pipe on the pump and the discharge pipe should be large. A No. 4 centrifugal pump that draws water from a single well should have at least a six-inch suction pipe, and the discharge pipe

ECONOMICAL HEIGHT WATER MAY BE LIFTED.

It is very unlikely that it will pay to pump water, under present conditions in the valleys of the western plains, to a total height of more than thirty feet, including the suction lift of the pump. If the pump lower the water in the wells ten feet; and if the distance to water be ten feet below the ground, and the discharge pipe be brought into a reservoir or flume five feet above the surface of the ground, the total lift will be thirty feet, if five feet be added to cover loss of head due to friction in suction and discharge pipe.

STORAGE RESERVOIRS.

In order to irrigate economically from pumping plants it is usually desirable to pump the water into a reservoir having a capacity equal to the amount of water the plant can furnish in six to eight hours. Such a reservoir is absolutely necessary for best results with small pumping plants. If the supply of water exceeds 500 gallons per minute it is possible to dispense with

when the plant is not running as when running. The rate of depreciation when idle will greatly exceed the rate when running, if the machinery is neglected and carelessly exposed. The charge for depreciation and repairs should not be estimated at less than 10 per cent of the first cost of the plant.

APPROXIMATE COST OF FUEL REQUIRED TO PUMP 1,000 GALLONS OF WATER PER MINUTE FOR VARIOUS LIFTS.

Total lift	Engine horsepower required	Cost per hour of fuel, gasoline 16 cents per gal.	Cost per hour of fuel, gasoline 20 cents per gal.	Cost per hour for coal at \$8.00 per ton in suction gas producer plant	Cost per hour for coal at \$4.00 per ton in condensing steam engine	Cost of Depreciation and repairs on machinery, etc., per year
Feet.		Cents.	Cents.	Cents.	Cents.	Dollars.
10	16	11.2	14	4.2	6	70
20	11	22.4	28	8.4	12	140
30	16	33.6	42	12.6	18	210

NOTE.—1,000 gallons of water per minute pumped continuously for eleven hours is equivalent to two acre feet of water.



The Famous Clearwater Country, Idaho. Northern Pacific Railway.

the reservoir, especially if the supply greatly exceeds this amount. Plants furnishing over 1,000 gallons per minute can usually be best operated without the use of a reservoir.

COST OF PUMPING.

The cost of recovering ground water from wells is made up of four principal items: (1) fuel and supplies; (2) labor; (3) depreciation and repairs; (4) interest on the first cost of the plant, or on the capital invested. The first and third of these items are partially under the control of the owner of the plant. If the installation is carefully designed and its parts well proportioned, the cost of fuel can be kept at a minimum; and similarly, the charge for depreciation and repairs will be kept low if good machinery be purchased in the first place, and careful attention be given to its maintenance when in operation and when idle. The charge for depreciation will be as great, if not greater,

The accompanying table gives an estimate of approximate cost for fuel and maintenance of a pumping plant having a capacity of 1,000 gallons of water per minute for total lifts of ten, twenty and thirty feet.

In order to determine approximately the cost of pumping water any distance between twenty and thirty feet, a proportional part of the cost for ten feet can be added to the cost for twenty feet. Thus, to get the cost of pumping water a distance of twenty-five feet, half of the numbers in the first line of the table can be added to those in the second line. The table should only be used for estimating the cost of pumping water for lifts lying between twenty and thirty feet. The cost for ten feet is given for the purpose of making estimates, but it should not be supposed that the cost for this low lift would be merely half of that for the twenty-foot lift, as frictional losses and others would tend to make the cost for the low lift higher than that stated in the table.

FIRST COST OF PUMPING PLANTS.

At almost any point in the river valleys of the western plains complete pumping plants, including wells, machinery and buildings, can be constructed for about \$100 per horse power required. In some exceptional cases the cost may run as low as \$60 per horse power.

Tests of a number of pumping plants in the Rio Grande River Valley are reported on in Water Supply and Irrigation Paper No. 141. On page 34 of that paper will be found a table giving the fuel cost, interest and labor cost, estimated for each acre foot of water recovered.

The pumping plant of Mrs. M. Richter, near Garden City, Kan., uses a Menge pump, which is run by a ten-horse power Otto gasoline engine. The area of the strainer and the bottom of the well is 266.5 square feet. The specific capacity per foot of percolating surface is .341 gallons per minute. The cost of operation with gasoline at 20 cents per gallon amounted to 21 cents per hour, .89 cents per thousand gallons, \$2.90 per acre foot, and 1-17 cents per thousand foot-gallons.

The pumping plant of Nathan Fulmer, near Lakin, Kan., utilizes a chain and bucket pump. The power is supplied by a Howe gasoline engine, which develops about seven horse power at 285 revolutions per minute. The cost of gasoline was 21 cents per gallon and the expense of running the engine was 13.65 cents per hour. The cost of water was \$1.37 per acre-foot, .22 cents per thousand gallons, and 1-40 cents per thousand foot-gallons.

The pumping outfit of J. H. Logan, near Garden City, Kan., consists of a six-horse power horizontal gasoline engine connected by a belt to a No. 3 centrifugal pump. The specific capacity of the well is 422 gallons per minute, or 3.94 gallons for each square foot of well strainer. The fuel cost of pumping was .9 cents per thousand gallons, \$2.93 per acre-foot, or 1-25 cent per thousand foot-gallons.

The cost of pumping at twelve plants in the Arkansas Valley in western Kansas ranged from 85 cents to \$3.75 acre-foot. Additional data are given in Water Supply and Irrigation Paper of the United States Geological Survey No. 153. On page 82 of that paper is an account of a test of a producer gas pumping plant at Rocky Ford, Colo.

INCORPORATED.

Gulf Coast Irrigation Company of Kingsville, Texas; \$500,000. Incorporators, R. A. Jackson, Benjamin S. Cabel, H. I. Miller, S. T. Fulton, C. E. Craig, N. H. Lassaiter and R. W. Harrison.

HAWAIIAN BULLETINS.

Two instructive bulletins have been issued by the Hawaii Agricultural Experiment Station. One by Edmund C. Shorey, chemist of the station, is entitled "The Composition of Some Hawaiian Feeding Stuffs," and the other by Jared G. Smith, special agent in charge of the station, is entitled "The Black Wattle in Hawaii."

Send \$2.50 for The Irrigation Age
1 year, and the Primer of Irrigation

THE STEENERSON DRAINAGE BILL.

IN THE HOUSE OF REPRESENTATIVES.

June 6, 1906.

Mr. Steenerson introduced the following bill; which was referred to the Committee on Agriculture and ordered to be printed.

A BILL

Authorizing the Secretary of Agriculture to investigate the subject of drainage.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled.

That the Secretary of Agriculture be, and he is hereby, authorized and required to investigate the subjects hereinafter specified and to report to Congress the results of such investigation.

First—The location and area of lands in the United States that are swamp and overflowed and susceptible of being drained and made fit for agriculture.

Second—The value and effect of drainage on such land and on the public health and upon agriculture.

Third—Existing legislation of the different States and localities on the subject of drainage and operations thereunder.

Fourth—Foreign drainage policies and their result, and the relation of the Federal Government to local authorities and legislation on said subject.

Sec. 2. That the sum of twenty-five thousand dollars, or so much thereof as may be necessary, be, and the same is hereby, appropriated out of any money in the treasury not otherwise appropriated, for the purpose of enabling the Secretary of Agriculture to carry the foregoing provisions into effect.

CAPITALISTS PLAN RESERVOIR.

A project is now on foot for the construction of a huge reservoir near Bloomfield, in Boulder county, Colo., for the purpose of irrigating about 200,000 acres of land lying east of Denver. An option was secured recently by Holland and Denver capitalists on 14,000 acres as a site for the reservoir, which will cost about \$2,000,000.

It is proposed to build a reservoir capable of holding back between 7,000,000,000 and 8,000,000,000 cubic feet of water, covering 1,600 acres to a depth of 100 feet. A series of subsidiary reservoirs will also be constructed at Erie, Brighton, Platteville, La Salle and Boulder canon. Water will be secured from South Boulder creek, the water rights to which have been secured, and by a tunnel through the continental divide for two and a half miles to bring water from Grand county. The men in the project own the High Line ditch, which will be utilized to carry water from the reservoir to the Platte river. From there it will be taken down the Burlington ditch and distributed to the dry lands near Brighton and Henderson.

Joseph Stanley, who made a fortune in mining in Colorado, is one of the Denver investors at the head of the project, and a representative has been sent to Holland to consult with investors, who have already shown an interest in the proposition. E. T. Hargrove, of Denver, is also interested in the project.

THE IRRIGATION PROBLEM.

Of Wind River or Shoshone Indian Reservation, Wyoming.

BY C. C. CARLISLE.

Just west of the center of the State of Wyoming lies a large tract of land known as Wind River or Shoshone Indian Reservation. The reason that this



Clarence T. Johnston, State Engineer, Wyoming.

large area of land is of especial interest at this time is the fact that on the 8th of August the greater portion of this reservation is to be thrown open to settlement.

The land to be settled lies north of Big Wind River and east of Popoagie River. The country is well protected from severe storms, being almost surrounded with mountains and entirely protected by these barriers on the side from which the prevailing winds of the

the opening of the reservation so that development can begin on the gold, the copper and the other valuable mineral mines, the extensive coal beds, the large soda deposits, the great oil reservoirs, the unlimited amount of cement and brick materials, and the large quantity of iron ore. One needs only to glance at the history of the iron industry of the United States to see what opportunities await where such immense quantities of iron ore and such unlimited coal beds are situated so close together.

The country has a gentle slope to the southeast, and the amount of irrigable land is limited only by the water supply—which means that several hundred thousand acres of land are to be reclaimed. Nearly the entire tract of tillable lands lies in an ideal position and slope for irrigation. There are some townships every acre of which can be easily watered. Most of the soil is loose sandy loam, free from alkali and other injurious chemicals. Greasewood and rabbit brush flats are not to be found, but most of the land is covered with black sage brush, salt sage and cactus, giving positive proof of the fertility of the soil.

The surrounding country is one of the greatest stock countries in the West, and near Lander, just south of the reservation, are some of the finest apple orchards in the State. This section has been retarded in the development of its resources and its industries by the lack of railroad facilities. With the Wyoming & Northwestern railroad completed to Shoshone and continuing through the reservation, and with the Burlington & Missouri River railroad rushing construction as rapidly as possible, endeavoring to reach the boundary at Thermopolis in time for the reservation opening, this drawback will be eliminated and leave nothing in the way to retard the rapid development which must inevitably follow.

History shows that the first settlers of nearly every colony on arid lands are from localities where irrigation



Lower Yellowstone, Irrigated Project—Picture Taken Near Sidney, Twenty Miles South of Mondak, Mont., Great Northern Railway—Oats Yielding Seventy-five Bushels per Acre.

State come. On the west and extending onto the reservation is the majestic range of the Wind River mountains, which form part of the continental divide. While on the north edge of the reservation, towering toward the sky, are the Owl Creek mountains. The snow-capped peaks and the timber are the best kinds of reservoirs, holding the streams up through the greater part of the irrigation season.

The amount of wealth stored away in these ranges can hardly be estimated. Capital is anxiously awaiting

is not carried on. These people know nothing about constructing practical irrigation ditches, and as a rule have insufficient capital to form companies to build the necessary canals. For this reason they are often unable to make a living until their lands are reclaimed, or else they become discouraged and leave the country.

Prof. Clarence T. Johnston, the State engineer, being one of the best authorities on irrigation matters of all kinds, realized the importance to the State, but more especially to the new settlers themselves, of making

it possible for each to hold his land and to make a comfortable living until prosperity should smile on him through the aid of irrigation. Since it would take considerable capital to construct the required irrigation system, there seemed but one solution to the problem, and that was to induce some company of sufficient funds to construct the required works on condition that permanent water rights and a share in irrigation works be sold to the farmers at a reasonable price, the terms of payment to be such as the farmers would be able to meet, and the settlers given employment on the construction work. With this plan in view, Mr. Johnston tried to secure permits from the honorable secretary of the interior for a number of responsible parties to make surveys on the reservation, so that each could plan a system for the irrigation of all lands susceptible of reclamation. The honorable secretary refused all permits on the ground that if one person were given permission to enter the reservation, all would have to be extended the same privilege. After conferring with the governor and other state officers, Mr. Johnston went to Washington, D. C., in January, and after three weeks of hard work secured permission for the state to make the surveys. He at once returned and began making preparations for sending surveying parties into the field. The state legislature had not foreseen this problem, so, of course, had made no appropriation for the work. The only method by which the necessary funds could be raised was to borrow the money, which Mr. Johnston did, giving his personal note. On the first of March three parties were sent into the field, and the surveys are being rapidly made.

In an article to the newspapers Mr. Johnston has explained his plans as follows: "The surveys now in progress will locate the necessary canals and reservoirs and designate the irrigable lands. We will furnish the honorable commissioner of the general land office with maps showing the location of these works, and the people who settle will be informed as to which tracts will be irrigated. We will work up all plans and specifications here, and these will be submitted to parties who desire to invest in irrigation works on the reservation during the summer. Bids accompanied with certified check for \$10,000 will be received by me, and the party which offers to construct all works under contract with the state will receive the permits from this office. The cost of the surveys will be deducted from the certified check of \$10,000. The successful bidder will have to put up a guarantee that the work will be constructed in a certain time and in accordance with the plans and specifications we make.

"Under this plan the people who settle will secure water rights at the lowest price that can be obtained through competitive bidding. The state will guarantee that the irrigation works will be of the best, and yet the state will not have to pay a cent toward the cost of surveying or making the necessary plans and specifications. It means much work for me in addition to that which we already have, but I will be glad to give all of my evenings, holidays and Sundays to the work, if necessary.

"All correspondence relating to these surveys is now in the office, a matter of public record and any one can read the letters at any time. The plans and specifications will be public property, and any person who wishes to submit a bid in good faith can do so. The bids will be opened before all the witnesses who

desire to be present, and public notice will be given of the result of the bidding."

Too much credit can not be given one who saddles onto himself additional work and responsibility for the good of the state. Although overtaxed with official work, as Mr. Johnston has been during the last few years, he is and always has been ready and willing to lend a hand in helping along any enterprise which would result in the public's benefit. Many evenings, up to eleven or twelve o'clock at night, and on holidays, he can be found in his office laboring away at his official duties or working with some committee on which he has been appointed, planning for the good of the city or the state. The state of Wyoming has always been among the most progressive states in irrigation matters, and through the wise appointments of her state engineers she still promises to hold her lead for a few more years at least.

RECLAMATION SERVICE PERSONALS.

Mr. Luke C. Robertson, of Austin, Texas, has received an appointment as assistant engineer in the Reclamation Service and has been directed to report at Montrose, Colorado, for duty in connection with the Uncompahgre project. Mr. Robertson graduated at the University of Texas, and took an additional three-years course in the engineering department of that institution, holding the position of student assistant during a portion of the time. He has recently been engaged with the H. & T. C. railroad.

Mr. John B. Stobo, of Greensboro, N. C., has received an appointment in the Reclamation Service as assistant engineer, and will report at Great Falls, Montana, for duty in connection with the Sun River project. Mr. Stobo has been engaged by the Erie Railroad as Transitman, and also by the Southern Railway Company designing concrete-steel arch bridges.

Mr. Hugh T. Caldwell, of California, has received an appointment as stenographer in the Reclamation Service by transfer from the Postoffice Department, and has been assigned to duty at Huntley, Montana, in connection with the Huntley irrigation project.

Mr. Walter N. Hill, of Berkeley, Cal., has received an appointment as engineering aid in the United States Reclamation Service, and has been assigned to duty at Corbett, Wyoming, in connection with the Shoshone project. Mr. Hill attended the Wesleyan University, and has taken a course in surveying in the Mining College of the University of California.

Mr. R. M. Packard, of Ithaca, N. Y., has been directed to report to engineer R. S. Stockton, Huntley, Montana, for duty in connection with the Huntley irrigation project. Mr. Packard, who is a student at Cornell University, has had experience in hydrographic work for the United States Geological Survey.

In connection with the co-operative work between the United States Reclamation Service and the Department of Agriculture, Prof. F. C. Miller, of the Forest Service, will at once begin a study of the tree planting possibilities in the North Platte irrigation project.

The Bureau of Forestry will begin at once a thorough study of the tree planting possibilities in that project in co-operation with the work of the Reclamation Service on the Truckee-Carson irrigation project, Nevada. The work will be directed by Mr. E. O. Siecke.

Mr. John C. Holmes, of Omaha, Neb., has received an appointment as assistant engineer in the United States Reclamation Service, and will be assigned to duty on the Huntley project, Montana. Mr. Holmes took the degree of civil engineer at the University of Nebraska, and has had experience in various capacities in surveying and designing tile drain systems. He was formerly engaged as structural engineer by the Des Moines Bridge and Iron Works, Des Moines, Iowa.

THE CONSTRUCTION OF IRRIGATION DITCHES.

Ditches Which are Permanent Waterways Compared with Those Constructed with No Thought of Nature's Laws.

There are few irrigation projects which do not represent more or less open ditch construction. Since the enactment of the Irrigation law, government engineers have been engaged in measuring the rivers and streams of the West and calculating the quantity of water available for irrigation purposes, and many persons have predicted that there will be ultimately as much as 150,000,000 acres reclaimed west of the one hundredth meridian and converted into the thrifty fields of a land of plenty in the heart of a desert.

But while effort is making to conserve every avail-

Drainage Investigations of the United States Department of Agriculture, gives an exhaustive report of the losses from canals from seepage and evaporation in the eleven principal arid States of the West. The general average of all these measurements shows that 6.76 per cent of the water entering the canals is lost in each mile in length, the losses range from 0.3 to 64 per cent per mile. Investigations also show that the seepage is proportionately much larger in small ditches than larger ones, and that there is an advantage, where possible to do so, in carrying water in large ditches rather than in several small ones.

It is well known that an open ditch ten feet wide, with a grade of three feet per mile and with a depth of six inches of water, has a mean velocity of only 1.4 feet per second, but if flowing eight feet deep in the



This Ditch Was Built by the Austin Drainage Excavator and was Two and a Half Years Old and Had Withstood the Frosts and Freshets of Two Winters at the Time This Photograph Was Taken.

able drop of water for irrigation by the construction of dams and reservoirs, and a more economical application of the use of water for irrigating crops is advocated, few realize the enormous waste of water caused by improperly constructed ditches. Not many residents of irrigated districts realize that in many instances 90 per cent of the water entering irrigation ditches is lost through seepage in the mains alone, and this could be largely prevented if the ditches were constructed on a scientifically correct principle.

Mr. R. P. Teele, in his review of irrigation work of the year 1904, in the Annual Report of Irrigation and

same ditch the mean velocity is increased to 3.8 feet per second. It is therefore evident that irrigation ditches should not only be constructed as deep as practicable, but in a manner which will maintain or increase the original depth. It is also self-evident that ditches containing loose earth or caved banks offer more obstructions to the flow of water, and the seepage is far greater than in ditches built true to grade with sides and bottom perfectly smooth and containing no loose earth.

In ditches built with dipper dredges or steam shovels it is impossible to construct sloping sides, and

the bottom and sides are more or less torn up by the shovel. It is therefore necessary to grade such ditches down to sloping banks, else they will be much more irregularly formed by caving banks. It is well known that water seeps through loose earth more rapidly than the original strata of the earth, and in a ditch built with properly sloped, perfectly true banks, leaving the original strata of the earth in banks and bottom undisturbed, and with all loose earth removed, there will be far less seepage than when constructed in an irregular manner and graded down or left to nature to cave the banks to the proper slope.

Where there is a large amount of seepage near land of a lower level the low lands not only frequently become saturated with water, but if there is a considerable amount of alkali this concentrates in these lands, mak-

Chicago. This excavator operates on an entirely new principle and is especially adapted for irrigation work, not only on account of the superior manner in which the ditch is made, but also for the reason that no water is required in which to operate the machine.

This machine constructs a ditch of practically any depth, width of top or width of bottom desired, and slopes the sides to any angle at a single operation. The waste banks are also constructed at a distance from the ditch and they may be made continuous to serve as dykes, thus increasing the capacity of the ditch, or the earth can be delivered to either side.

In operation the machine rests on a track having one rail on each side of the ditch and excavates with equal rapidity traveling forward or backward. The excavating buckets travel in guide-ways transversely of



This Ditch Was Made by the Austin Drainage Excavator and Had Passed Through the Frosts and Freshets of One Winter at the Time This Photograph Was Taken.

ing them absolutely worthless until a drainage system is provided at a cost often nearly equal to the expense of the irrigation system, and it then often requires several years to remove the alkali from these lands sufficiently to make them crop producing. Irrigation ditches constructed on a scientifically correct principle, therefore, not only husband the water in the irrigation mains, but also obviate the construction of a drainage system and almost entirely overcome the danger of the accumulation of surplus alkali.

A machine which has been on the market about three years and which is attracting a great deal of attention among engineers engaged in reclaiming arid lands is the Austin drainage excavator, manufactured by the F. C. Austin Drainage Excavator Company, of

the ditch and shave off a thin slice down one side, across the bottom and up the opposite side.

The frame carrying the buckets is lowered as the ditch increases in depth, so that the banks and bottom are cut to exact specification. There is no loose earth in the ditch and the original strata of earth in the banks and bottom are undisturbed and remain as firm as nature made them.

A ditch built in this manner and left perfectly smooth contains no obstructions and will therefore maintain a maximum flow of water, and since the ditch is cut out of the solid strata of the earth, with banks and bottom remaining firm and true to grade, a small amount of silt will form a film over the surface, cementing the sides and bottom, thus assuring a permanent waterway of largest possible capacity.

Excavated in this manner, the earth taken from the ditch is comparatively dry and is delivered at a distance, insuring a berm of from ten to fifteen feet, so that there is no weight added to the banks of the ditches and the waste banks are therefore not likely to be returned to the ditch by erosion, nor will the banks cave, as is the case when torn up by a shovel and the waste bank delivered immediately adjoining the ditch.

When this new style of excavator was first introduced, contention was made that a ditch of this construction would be no better than one built by dipper dredges after several freshets or after having withstood the frosts of one or two winters. It was conceded that a much more perfectly shaped ditch was made than could be dug with dredges. But the important question was, will a ditch built in this manner prove a more permanent waterway, retaining its maximum capacity and therefore become a much more economical ditch than can be produced by other methods, or was it simply a ditch of greater temporary neatness in appearance? No argument is as convincing as the ditches themselves. Ditches have been dug by this method for three years in Indiana, Illinois, Iowa and Minnesota in nearly every kind of earth, including the deep black prairie soils, which are easily eroded, and ditches in Minnesota particularly susceptible to caving from the action of frost.

We are illustrating herewith two ditches made by this machine. The one showing the compound curve—or right and left curve—is located in La Salle County, Illinois. The photograph was taken early in spring, after the winter's frost had left the ground, and the water had receded after a spring freshet, a condition which would plainly show any inclination of the banks to cave. The other ditch shown is located in Lee County, Illinois, and was one of the first constructed by this method. At the time this photograph was taken the ditch had been built two and one-half years and had passed through two winters.

This ditch is worthy of special study. Note that the waste banks have been little affected by erosion. The berm is practically its original width and it is therefore reasonable to suppose that little of the excavated earth will ever be returned to this ditch by erosion. The banks of this ditch, by being shaved out of the original strata of the earth and left perfectly firm, are nearly as smooth as the day they were built. The ditch by being constructed perfectly true to grade and containing no loose earth to obstruct or change the current, has increased in depth and the channel has been deepened most in the exact center of the ditch. This is a positive proof that a ditch built in this manner retains its shape. It also substantiates the argument that a scientifically correct ditch is obtained only when dug in a manner which will not disturb the earth in the banks or bottom and leave them as firm as nature made them.

It is well understood that practically all irrigation ditches of the Southwest carry water containing silt possessing cementing properties. When a ditch is constructed in this manner in this territory, a small amount of this silt will effectually seal the ditch, in most kinds of earth, not only maintaining a maximum capacity, reducing the seepage to the minimum and obviating the construction of drainage ditches in irrigated districts, but also removing the peril of most irrigated lands—the accumulation of surplus alkali.

RECLAMATION SERVICE NOTES.

The Williston Water Users' Association, of North Dakota, has guaranteed the return of the moneys invested by the United States in the construction of the irrigation works of the Williston project.

On June 13 the Secretary of the Interior withdrew from any form of disposition whatever under the public land laws a strip of land extending around Goose Lake in northeastern California and southwestern Oregon for use in connection with the Pitt river irrigation project. The area withdrawn covers approximately 40,000 acres.

A contract has been awarded to the Canton Bridge Company, Omaha, Neb., for the construction of five highway bridges in connection with the Belle Fourche irrigation project, South Dakota. The bid was \$1,200 for each bridge.

Authority has been granted to the Reclamation Service to purchase from the Atlantic Equipment Company, of New York City, two steam shovels for use in the construction of canal and embankments in connection with the Payette-Boise project, Idaho. The bid was \$8,750 each, f. o. b. cars at Richmond, Va.

The Secretary of the Interior has executed a contract with the Umatilla Water Users' Association to secure payment to the United States of the cost of construction of the irrigation works for the reclamation of arid lands in the State of Oregon, under the act of June 17, 1902, in what is known as the Umatilla project.

William H. Thompson was the successful bidder for the construction and completion of the work provided for in schedule 1, main canal, Payette-Boise project, Idaho. This contract calls for the excavation of approximately 402,000 cubic yards of material. The contract price is \$93,325.

The Ticton Water Users' Association, of the Yakima Valley, Washington, is to secure repayment to the United States of the cost of construction of irrigation works for the reclamation of arid lands in the State of Washington.

The bid of the Pacific Portland Cement Company, of San Francisco, has been accepted for furnishing 8,000 barrels of Portland cement for use in the construction of the Okanogan and Umatilla projects. The bid was \$1.65 per barrel, f. o. b. cars at Tolenas, Cal.

By the terms of a contract executed between the United States and the North Platte Valley Water Users' Association, a corporation duly organized and existing under the laws of the State of Nebraska, the Water Users' Association guarantees the return of the moneys invested by the United States in the construction of the irrigation works of the North Platte project.

Reclamation Service has been authorized to complete the work on the main supply canal, Belle Fourche project, South Dakota, by force account. This work was abandoned by the Widell-Finley Company, and no bids were received for its completion.

Proposals will be opened at 876 Federal building, Chicago, on July 7, for furnishing 45,000 barrels of Portland cement, or any part thereof, f. o. b. cars at the bidder's mill. Particulars may be obtained from the Chief Engineer of the Reclamation Service, Washington, D. C. This cement is to be used in connection with the North Platte, Shoshone and Garden City projects.

Proposals are solicited for the construction of a combined office and residence building in connection with the Garden City project, Kansas. The bids will be opened July 10 at Garden City, Kas. Particulars may be obtained upon application from the engineer at Garden City.

Owing to the inclement weather experienced by the several contractors on the work on the Minidoka project, Idaho, during the past winter, the Secretary of the Interior has granted an extension of thirty days time for the completion of the work to the following contractors: Orman & Crook, Monarch & Porter, and the Bates & Rogers Construction Company. This extension calls for the completion of the work on July 1, 1906.

Proposals are being solicited for the construction and completion of the Strawberry tunnel, Strawberry Valley project, Utah. The work involves 18,000 linear feet of tunnel, the same being a portion of a system for the diversion of about 500 cubic feet of water per second from Strawberry River to the Spanish Fork Valley. The bids will be opened at Salt Lake City on August 30, and particulars may be

obtained from the office of the Reclamation Service at Washington, D. C., or Salt Lake City, Utah.

In response to a request from the Secretary of the Interior the Postmaster General has issued orders requiring the carrier on Star Route 63,382, Glendive to Mondak, Montana, to provide box delivery and collection service for the office of the Reclamation Service at La Mesa, Montana, and on the road leading thereto. He has also directed that the present mail facilities be continued at Ft. Shaw, Montana, on route 63,325, Augusta via Ft. Shaw, Sun River and Sunnyside, to Vaughn railroad station, and extending the service to six times a week so as to begin at Ft. Shaw instead of Sun River.

Proposals are asked for the construction of about fourteen miles of canal for the diversion of 850 cubic feet of water per second from the St. Mary River, Montana, at a point about thirty-five miles northwest of Browning. The work involves the excavation of about 1,700,000 cubic yards of material. The bids will be opened at Browning, Montana, on July 31. Particulars may be obtained at the office of the Reclamation Service, Washington, or from C. C. Babb, engineer in charge of the St. Mary project, Browning, Montana.

An extension of forty-five days has been granted to Wood, Bancroft & Doty in which to complete their contract for the construction of embankments 3 and 4, Hondo project, New Mexico. Owing to the adverse weather conditions and the scarcity of labor, it was impossible for the contractors to complete their work as required by their contract, but as the embankments have reached a stage where the delay will not interfere with the placing of rip-rap, no loss will be occasioned the Government by the extension.

During the month of May work progressed rapidly on the Gunnison tunnel, about 1,300 feet having been excavated during that period. On that date the total excavation was 12,454 linear feet, or five-twelfths of the whole. Work was begun on the tunnel on January 11, 1905, and has been maintained without interruption ever since, having been carried on by the Government under force account since May 27, 1905, when the work was taken out of the hands of the contractors.

A contract has been executed on behalf of the United States with the Utah Fire Proofing Company, of Salt Lake City, Utah, for the construction and completion of the work provided for in schedule 1 of the dam, main canal and embankments under the Payette-Boise project. This contract calls for 15,000 cubic yards of concrete masonry, 5,000 cubic yards of concrete, 10,000 pounds of steel for reinforcement, 325,000 feet B. M. of lumber and other material, and for 28,000 cubic yards of excavation. The contractors' bid was \$158,950.

Bids are being solicited for the construction of the Corbett dam, located on the Shoshone River about eight miles northeast of Cody, Wyoming. These bids are to be opened on July 10, 1906. The dam will require about 10,000 cubic yards of excavation, 5,000 cubic yards of concrete, 9,000 cubic yards of earth and gravel embankment and the placing of 250,000 pounds of steel reinforcement. Particulars may be obtained from the office of the Reclamation Service, Washington, D. C., or from the project engineer at Cody, Wyoming.

After a careful investigation of conditions connected with the Lake Desmet project, Wyoming, it has developed that the conditions are more favorable for irrigation by private enterprise than by the Government. The Secretary of the Interior, therefore, has restored to settlement a tract of land which was temporarily withdrawn in connection with this project, such land not to be subject to entry, filing or selection however, under the public land laws until ninety days after notice by such publication as may be prescribed by the Department. The tract thus restored consists of the public lands within an area of about 400,000 acres.

Bids are solicited for the installation of steam and electric pumps, electric generating and transmission apparatus, including three pumping stations containing centrifugal pumps of 20 and 30 cubic feet per second capacity under heads of from 50 to 60 feet, driven by steam engines and electric motors aggregating 1,200-horsepower; also two 300 K. W. steam turbine generating units, a 1,000-horsepower boiler plant and accessories, the necessary buildings and three-mile transmission line. These works are to be located in the vicinity of Williston, North Dakota. The bids will be opened at Williston on July 9. Particulars may be obtained at the office of

the Reclamation Service, Washington, D. C., or from the engineer at Williston.

A reconnaissance survey will be made to establish the practicability or impracticability of the construction of the proposed works for securing an adequate water supply for the city of Lawton, Oklahoma. The records obtained by the Geological Survey in a previous examination of the water resources of the vicinity of Lawton will materially reduce the expense of this work. The engineer in charge has been instructed to investigate the various sources of water supply that are capable of development, the nature and cost of the work and material to develop the same, the quantity and quality of water which can be obtained, and whether the supply would be permanent and continuous or liable to fail in times of drouth.

Surveys and investigations in connection with the proposed Silver Creek project, Oregon, have been carried to a point where it is deemed advisable to restore to entry all lands not necessary to the development of the project, and the Secretary of the Interior has directed that all the following lands, the title to which has not passed out of the United States, be immediately restored to settlement, but such lands shall not be subject to entry, filing or selection under the public land laws until ninety days after notice by such publication as may be prescribed by the Department:

Willamette meridian, Silver Creek project, T. 24 S., Rs. 26, 27 and 28 E., all. T. 25 and 26 S., Rs. 27, 28 and 29 E., all.

The bid of the Billings Construction Company, of Billings, Montana, for the construction of Division 1, Garland Canal, Shoshone project, Wyoming, for sections 2, 3 and 8 only, and also the bid of Hughes & Olson, Butte, Montana, for the construction of all of sections 2 to 8, except section 5, have been rejected. In the opinion of the Director of the Reclamation Service the bids are high, and as they are only for detached sections of the canal, he recommended their rejection. A readvertisement for bids for this work has been ordered.

The Reclamation Service has received orders to proceed at once with the work of construction on the Umatilla irrigation project, Oregon, for which the sum of \$1,000,000 was set aside from the reclamation fund by the Department on December 4, 1905. The Umatilla project embraces 20,000 acres immediately south of Columbia River and east of Umatilla River. The engineering work in connection with this project consists of a feed canal from Umatilla River to the Cold Springs reservoir, and a distribution system. The works are of simple character and capable of being constructed in a short time. The irrigable area under this project lies below 500 feet in altitude, is rolling in character, and the lands are of high fertility. The climate is warm and the soil adapted to orchards, small fruit and vegetables. Transportation facilities are excellent, the lands being within 200 miles of Portland, Oregon, of Spokane, Washington, on the main lines of the Oregon Railroad and Navigation Company.

The towns at both ends of the Government line of the Lower Yellowstone irrigation project, Montana and North Dakota, are to be connected by telephone. The present telephone line extending up and down the river, a distance of about sixty-five miles, was constructed as a necessary part of the project for the conduct of Government business in construction work and also in the operation of the irrigation system, but it is not connected with the railroad at either end of the line and can not therefore be used in connection with freight shipments and other important features in the management of work on the project. Connections will be established therefore with the town of Glendive on the south and Mondak on the north by use of existing lines, a switching charge of 10 cents being made for each message. It is proposed also to allow the contractors and residents the use of the Government line by paying to the Government the nominal switching charge of 10 cents, the moneys collected to be covered into the Reclamation fund as receipts obtained in connection with the operations under the Reclamation Act.

The Conconully Lake Reservoir Company, Conconully, Washington, has agreed to give the perpetual and exclusive right to occupation, use and control of the reservoir and all the lands, right of way, privileges and appurtenances used or owned by the company in connection with the reservoir for the consideration that said company shall receive a water supply for the irrigation of the lands of its stockholders, being the water rights now vested in them, to the extent of

three acre feet per acre per annum during the irrigation season, said water to be delivered and furnished at their points of diversion from Salmon Creek for the lands specified in the agreement, it being provided, however, that the stockholders of said company who receive this water supply are to pay to the United States the annual maintenance charge as fixed for the lands supplied from said system, according to the regulations governing the same under the Reclamation Act.

On June 21 the Secretary of the Interior withdrew for disposition in accordance with the provisions of the Act of April 16, 1906, 160 acres in each of the townsites of Rupert, Heyburn and Scherrer on the Minidoka project, Idaho. The areas withdrawn have been platted and will be sold at public auction on a date to be set in the near future.

An extension of time has been granted to the General Electric Company, of Schenectady, N. Y., for furnishing certain machinery for use in connection with the Salt River irrigation project. The contractors were prevented from manufacturing the machinery in question by reason of the failure of the contractors for the water wheels to furnish them with designs of water wheels which are to be used as

cubic yards of material, 100,000 cubic yards of overhaul, 900 linear feet of terra cotta pipe, and 2,000 cubic yards of puddling. The bid of the contracting company was \$245,038.

Proposals are being solicited for the construction of a pumping plant in connection with the Huntley project, Montana. This work involves about 15,000 cubic yards of earth excavation, 600 cubic yards of concrete, building about 2,000 feet of reinforced concrete pipe, furnishing 120,000 pounds of steel, and furnishing and installing a water power pumping plant consisting of two vertical shafts pumping units and accessories, each unit having a capacity of 28 cubic feet of water per second, lifted fifty feet. The plant will be located near Ballantine station on the Chicago, Burlington & Quincy Railway, twenty-three miles east of Billings, Montana. Particulars may be obtained from the chief engineer, Reclamation Service, Washington, D. C., or from the project engineer, Huntley, Montana.

A contract has been let to John A. Nelson, of Sidney, Montana, for the construction and completion of Divisions 8 and Laterals F, O and P, main canal and lateral system, Lower Yellowstone project, Montana and North Dakota. This work involves 179,540 cubic yards of excavation, 7,000 cubic yards



Flume of Spokane Canal Company—Near Spokane, Wash.,
on the Great Northern Railway.

a base for the machinery to be furnished by the General Electric Company.

Upon the request of the Department of Agriculture the Secretary of the Interior has withdrawn for forestry purposes Sections 9, 10, 15, 16, 22, 23, 26, 27, 34 and 35, T. 3 N., R. 3, W. B. M. Idaho. A portion of these lands were withdrawn for reclamation purposes in connection with the Payette-Boise irrigation project. It is the desire of the Agricultural Department to utilize this area for park and experimental purposes and under the ruling of the Secretary of the Interior the tracts withdrawn will constitute an addition to the Saw Tooth Forest Reserve.

Proposals are asked for the construction of Division 1, Garland canal, Shoshone project, Wyoming. This work involves the excavation of about 800,000 cubic yards of earth, about 98,000 cubic yards of rock and shale, and the construction of incidental structures about fifteen miles northeast of Cody, Wyoming. The bids recently received for this work were rejected as too high, and for the reason that they were for isolated portions of the work only.

A contract has been awarded to D. H. Freeman & Co., of St. Cloud, Minn., for the construction and completion of Division 3 of the main canal, Lower Yellowstone irrigation project, Montana and North Dakota. Division 3 consists of nine miles of canal involving the excavation of 1,088,800

of overhaul, and 700 cubic yards of puddling. Mr. Nelson's bid was \$29,985.

It has been decided to increase the allotment for the Yakima Valley projects. The increases are as follows: For the Tieton project, \$250,000; the Sunnyside project, \$350,000, and an allotment of \$100,000 for the purpose of repairing and completing the existing canals; and for the storage of water so as to place under proper irrigation the lands under the present canals in the Yakima Indian reservation.

Proposals are requested for furnishing about 405,000 pounds of steel bars for the Shoshone project, Wyoming. These bars are to be used to reinforce concrete, and the bids will be opened at Billings, Montana, July 24. Detailed information may be obtained from the office of the Reclamation Service, Washington, D. C., or Cody, Wyoming.

A contract has been signed with D. H. Freeman & Co., of St. Cloud, Minn., providing for the construction and completion of the work of Division 1, main canal, Lower Yellowstone project, Montana and North Dakota. Division 1 consists of 7½ miles of canal, and involves the excavation of 823,000 cubic yards of material, 25,000 cubic yards of overhaul, 1,000 cubic yards of puddling, and 360 linear feet of terra cotta pipe. The bid of the contracting company was \$208,490.

NEW GAGING STATIONS.

The following new gaging stations have been established in Montana:

- On Ford Creek and Smith Creek near Augusta,
- On Milk River near Zurich, and
- On the Winter-Anderson Canal near Chinook.

THE QUESTION OF RESIDENCE.

An opinion has been asked as to whether a citizen of the United States, whose duties compel him to reside temporarily in Washington during the session of Congress, is entitled to purchase lands within the limits of a reclamation project from present owners and obtain the benefits of the Reclamation Act, providing he complies so far as his duties will permit with the rules and regulations as prescribed.

The Assistant Attorney General states that the question of residence is usually a mixed question of law and fact, and it would be impracticable to attempt to formulate a general rule to govern all cases; each must be determined upon the peculiar facts. Temporary absences do not necessarily terminate a residence once established. If the citizen shall establish in good faith a resident upon the land or in the neighborhood of the tract, and shall maintain such residence in accordance with the true intent of the law, his temporary absence would not disqualify him from receiving and holding a water right. His right would have to be determined by the facts as they develop in the future.

THE COLORADO RIVER DELTA.

The Reclamation Service is co-operating heartily with the Bureau of Plant Industry in a series of experiments which the latter is initiating in the vicinity of Yuma, Arizona. A plot of ground controlled by the Service has been turned over to the plant experts who propose to experiment with cotton and other crops.

The delta of the Colorado River has always possessed a singular fascination for the scientific men of the Department of Agriculture, and the results of these experiments can not fail to prove of inestimable value to the settlers who will take up homes in this region as soon as the Government's irrigation works are completed.

It is a demonstrable fact that no other portion of the United States when irrigated is capable of supporting a denser population than the Colorado delta. Five acres properly cultivated and irrigated will support a family in comfort, as the crop season is practically continuous. One crop follows another throughout the year. Oranges, pomelos, melons, all the small fruits and vegetables mature earlier there than in California, and consequently are marketable at the top prices.

LOWER YELLOWSTONE PROJECT.

BY H. N. SAVAGE, SUPERVISING ENGINEER, U. S. R. S.

Lower Yellowstone project in eastern Montana and western North Dakota contemplates the reclamation of 67,000 acres of land, two-thirds of which is in Montana. The canal takes its supply from the Lower Yellowstone River at a point about seventeen miles below Glendive, and extends down the left or west side of the river a total length of eighty miles.

Contracts have been awarded and construction is now proceeding on all but one of the divisions of this work. Bids were recently opened for constructing the main diverting dam across the river. This will be a timber crib and rock structure 600 feet long and 12 feet in height. It will serve to divert the low flow of the Yellowstone River into the main canal. The canal when completed will have a capacity of 1,700 acre-feet of water every twenty-four hours.

The initiation of the work has started a boom in real estate all over the valley. A great many new settlers have already arrived, and others are coming in every day. Many new buildings have been erected and others are in process of construction. Land for which there was very little sale at any price is now selling at \$25 and upward an acre.

WORK ON THE HUNTLEY PROJECT.

The Huntley irrigation project on the ceded portion of the Crow Indian Reservation, Montana, is attracting a great deal of attention just now by reason of the opening of the reservation to settlement under the general land laws on August 15th.

Although no definite arrangements have been made as to the method of opening the land under the irrigation project, it is probable that some similar form of drawing will be adopted as heretofore used in connection with the opening of other lands. Contracts have been awarded and construction is being rapidly pushed on all the work of the Huntley project. It is expected that the land under the irrigation system will be opened to settlement within a few months.

This project, which embraces approximately 50,000 acres, has a maximum length of thirty miles and extends along the right bank of the Yellowstone River, excepting at a point twelve miles east of Billings. It is traversed throughout its entire length by the Northern Pacific Railroad, and is crossed by the Chicago, Burlington & Quincy. Both of these railroads are arranging to establish stations every five miles, which will give the settlers under this project exceptionally good railroad and shipping facilities. Arrangements are also being perfected by the Reclamation Service for availing of the benefits of the recent town site bill passed by Congress whereby a small tract of land conveniently located and surrounding the railway stations can be subdivided and sold to settlers and others. By this arrangement each farm unit will have stores, postoffice, schools and churches within an average of less than two miles, and in no case to exceed 3½ miles distance.

Huntley Pumping Plant: In addition to the gravity supply for the lands under the main canal, advantage is taken of a drop of thirty-three feet in the canal from one terrace to another, to utilize the power thus available for lifting water from the canal to a height of fifty-five feet above. From the benches a canal will extend some ten miles and cover an additional 5,000 acres of land. The railway traveler on either the Northern Pacific or the C., B. & Q. lines is treated to a novel sight. The contractors have let sub-contracts to a number of organizations and individuals, with the result that camps of different nationalities are scattered throughout the twenty miles of territory being reclaimed. A collection of Indian tepees, a Japanese camp, also a number of Italians are there, each nationality having its collection of tents and cabins.

As private parties in the State of Oregon are becoming actively interested in the irrigation of lands which were withdrawn from entry under the following projects, and as lack of funds will for some years prevent development by the Government, it is deemed inadvisable to obstruct private enterprise for any length of time by continuing the withdrawal, and the Secretary of the Interior has therefore restored the following lands to settlement, not, however, to become subject to entry, filing or selection under the public land laws until ninety days after notice by such publication as the Commissioner of the General Land Office may prescribe:

Willamette Meridian.

MALHEUR PROJECT.

About 533,120 acres lying in Townships 16 to 20 S., Ranges 41 to 47 E.

CHEWAUCAN PROJECT.

- T. 31 S., R. 18 E., all.
- T. 32 S., Rs. 17, 18, 19 E., all.
- T. 33 S., Rs. 17 and 19 E., all.
- T. 33 S., Rs. 18 E., Secs. 1 to 25, 29 to 32, and 34 to 36 inclusive.
- T. 34 S., Rs. 19 and 20, all.

OWYHEE PROJECT.

- Ts. 21 and 22 S., R. 45 E., all.
- Ts. 21, 22 and 23 S., R. 46 E., all.

SILVER LAKE PROJECT.

- Ts. 26 and 27 S., Rs. 14, 15, 16 and 17 E., all.
- T. 28 S., Rs. 13 and 14 E., all.
- T. 28 S., R. 15 E., Secs. 1 to 14, 16 to 19, and 29 to 32 inclusive.

T. 28 S., R. 16 E., Secs. 1 to 18, 21 to 28, and 34 to 36 inclusive.

T. 29 S., Rs. 12, 13 and 14 E., all.

T. 29 S., R. 15 E., Secs. 4 to 9 and 15 to 36 inclusive.

T. 29 S., R. 16 E., Secs. 1 to 3, 10 to 15, and 19 to 36 inclusive.

ANA RIVER PROJECT.

T. 29 S., Rs. 17 and 18, all.

T. 30 S., R. 16 E., Secs. 2 to 36 inclusive.

T. 30 S., R. 17 E., Secs. 1 to 5 and 7 to 36 inclusive.

T. 30 S., R. 18 E., all.

T. 31 S., R. 17 E., all.

The Pacific Portland Cement Company, San Francisco, Cal., has contracted for supplying from 8,000 to 10,000 barrels of Portland cement for the Klamath project, California-Oregon, and has approved the bond of the Pacific Surety Company in the sum of \$3,000. The cement is to be furnished at \$1.55 per barrel, f. o. b. cars at Tolenas, Cal.

FOR SALE 160 acre water right on irrigation project near Denver, Colorado.

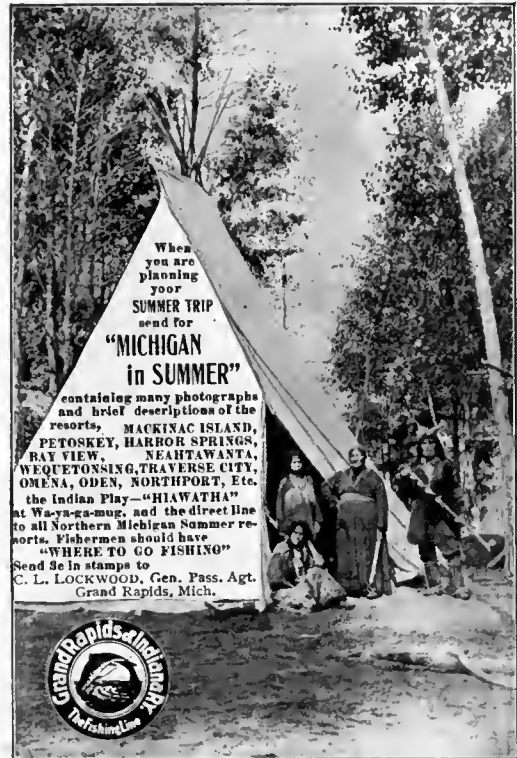
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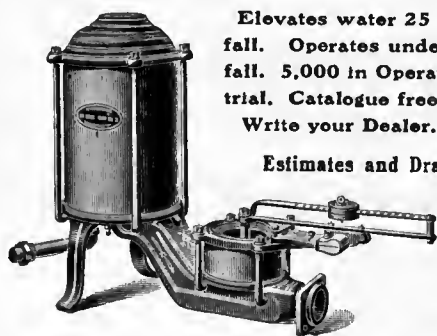
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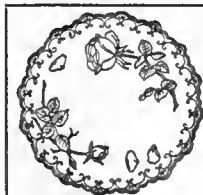
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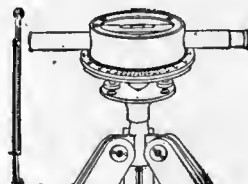
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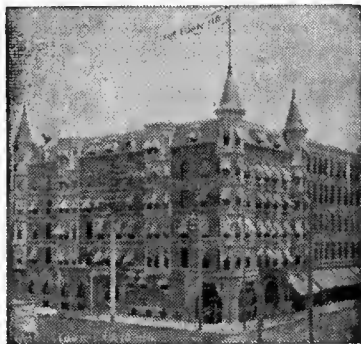
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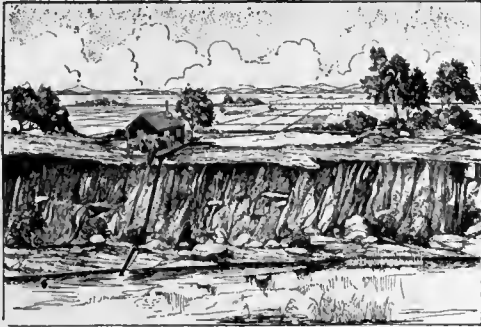
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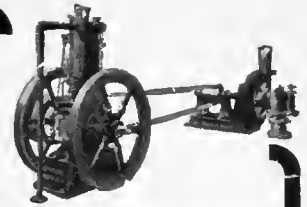
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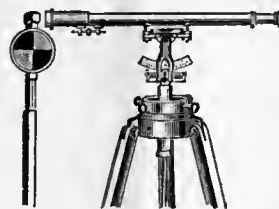


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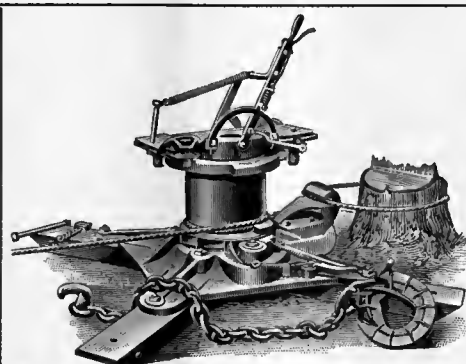


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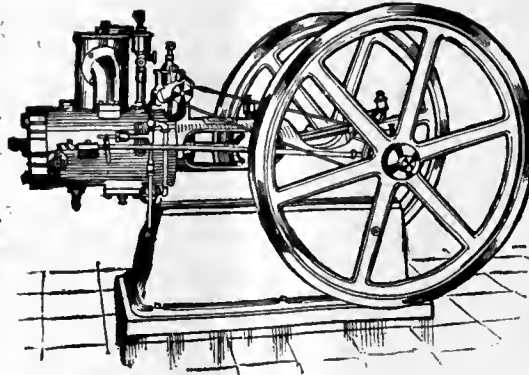
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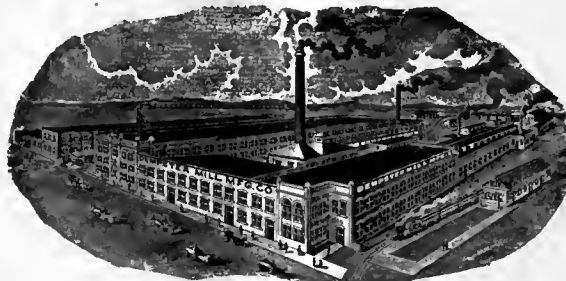
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VOL. XXI.

CHICAGO, AUGUST, 1906

No. 10.



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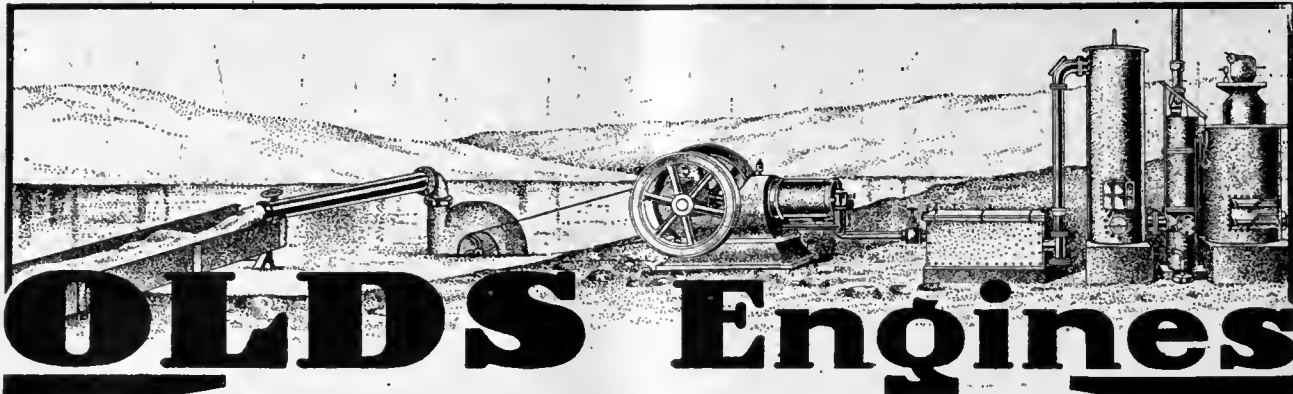
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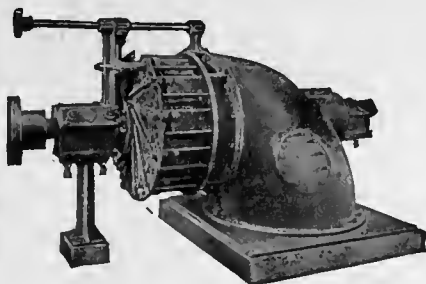
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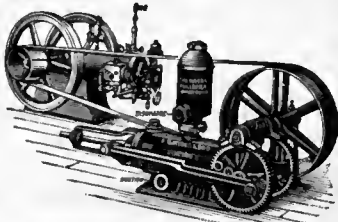


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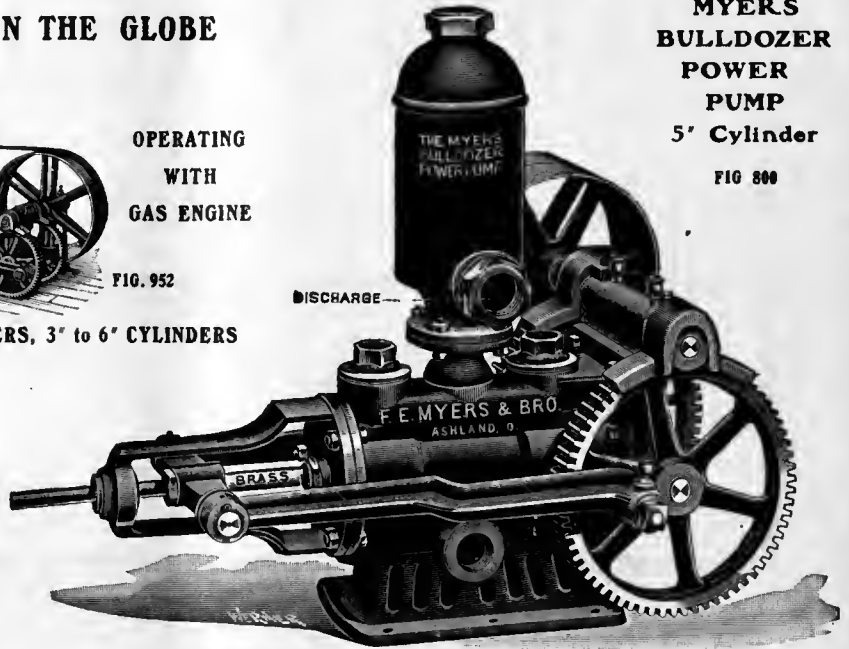
OPERATING
WITH
GAS ENGINE

FIG. 952

HORIZONTAL BULLDOZERS, 3" to 6" CYLINDERS

MYERS
BULLDOZER
POWER
PUMP
5' Cylinder

FIG. 800



MYERS
BACK GEARED
WORKING HEAD

TAPPED FOR
3' PIPE

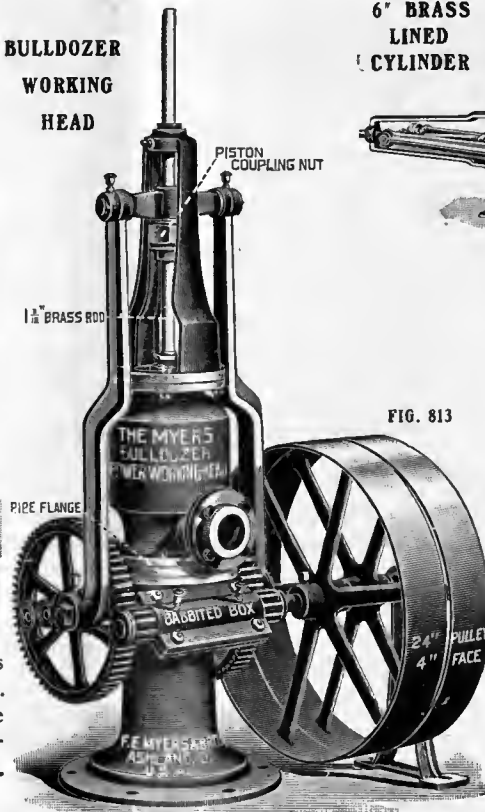
5, 7½ and 10"
STROKE

FOR
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FIG. 1113

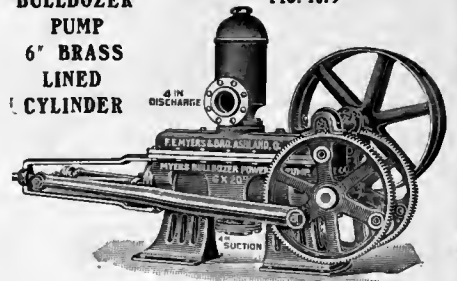


BULLDOZER
WORKING
HEAD



BULLDOZER
PUMP
6" BRASS
LINED
CYLINDER

FIG. 1079



MYERS BULLDOZER
WORKING HEADS

No. 359

5", 7½", 10" STROKE
DISCHARGE, 2½ or 3 INCHES
SUCTION 2 to 4 INCHES

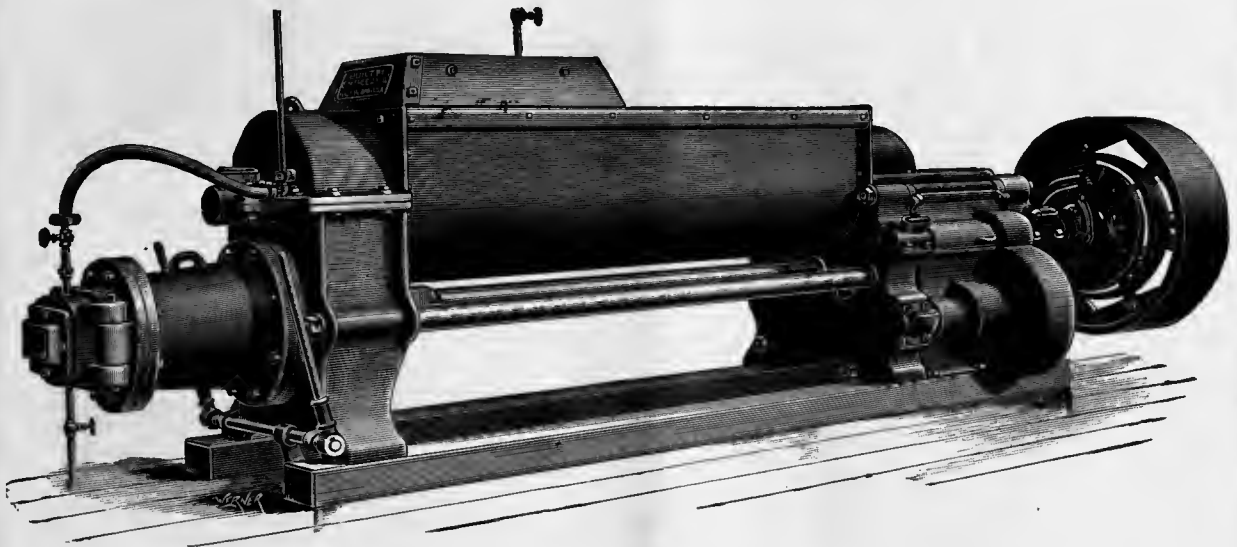
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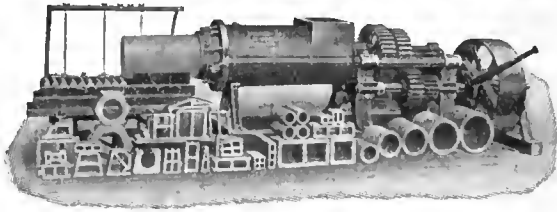


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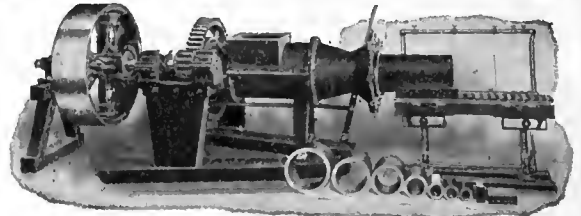
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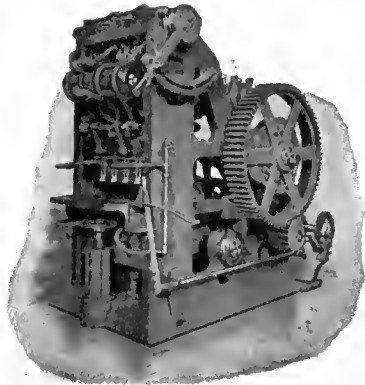
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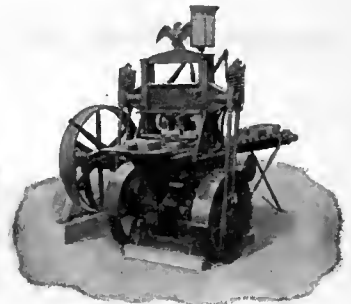
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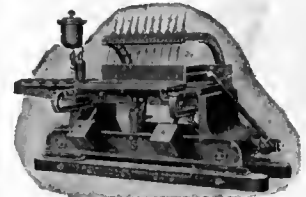
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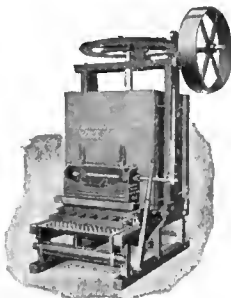
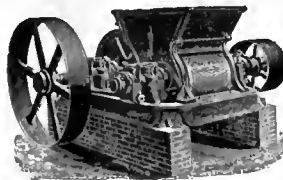
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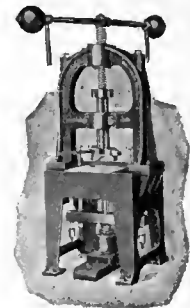
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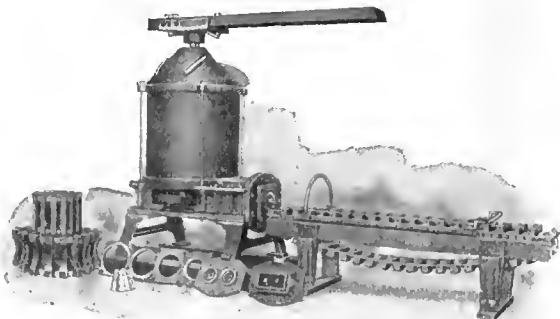
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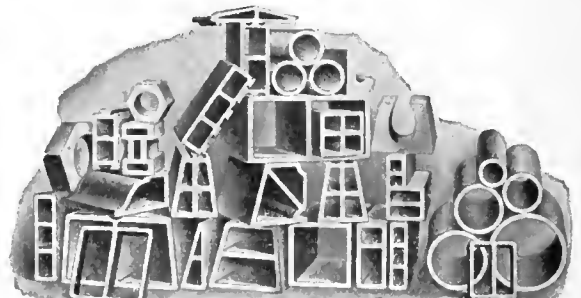
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THE IRRIGATION AGE

VOL. XXI

CHICAGO, AUGUST, 1906.

No. 10

THE IRRIGATION AGE

With which is Merged

MODERN IRRIGATION
THE IRRIGATION ERA
ARID AMERICA

THE DRAINAGE JOURNAL
MID-WEST
THE FARM HERALD

THE D. H. ANDERSON PUBLISHING CO.,
PUBLISHERS,

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D. H. ANDERSON, Editor
W. J. ANDERSON .. G. L. SHUMWAY
Associate Editors

ANNOUNCEMENT.

"The Primer of Irrigation" is now ready for delivery. Price, \$2.00. If ordered in connection with subscription, the price is \$1.50.

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Interesting to Advertisers.

It may interest advertisers to know that *The Irrigation Age* is the only publication in the world having an actual paid in advance circulation among individual irrigators and large irrigation corporations. It is read regularly by all interested in this subject and has readers in all parts of the world. *The Irrigation Age* is 21 years old and is the pioneer publication of its class in the world.

Millions. Millions of dollars are being spent in irrigation projects throughout the semi-arid region of the West.

Must Be Seen. The alfalfa fields of Washington, Oregon and California are like everything else in the Western wonderland—they must be seen to be appreciated.

Greater. The United States is one of the greatest countries that was ever put on a map—but irrigation will make our country measureably greater.

San Francisco. San Francisco is still on the map, though at present the town is a chaotic mass of charred ruins—twisted steel and broken brick—but, phoenix-like, San Francisco will rise from her own desolate ashes in which she now lies prostrate.

Take Notice. In looking around for new markets, the agricultural implement and machine manufacturers should not overlook the new West, for its rapid development means large requirements in the implement line.

Devotion to a lofty ideal of public and private duty will spell enduring strength and greatness of a nation much sooner than the money bags of mercenary traders and tricky politicians.

New Railroads. Many hundreds of miles of new railroads are being built in the Northwestern States. In North Dakota alone 1,000 miles of new road are said to be in the hands of the contractors. Both the West and Northwest are being developed, and the work is being pushed with a rapidity that must be seen to be thoroughly appreciated. It is reported that E. H. Harriman recently sent out specifications for the largest order of rolling stock—both engines and cars—that he ever placed at one time—and everybody knows that Mr. Harriman does not make a practice of doing things on a small scale. He believes in the West, and is backing his good judgment in a substantial manner.

Suggestion to Easterners. More American people should travel more in the West. It is all right to see Europe—but see your own country first—and do not forget that the half-way point between the Atlantic and Pacific oceans is way out in Kansas. The true greatness of our country can be understood only by those who have journeyed from ocean to ocean. Strawberries, grapes, apples, plums, prunes and many other fruits grow in the far West as they grow nowhere else on God's green foot-stool. It is difficult to understand the meaning of the word "fruits" until one has seen the real thing in the land of sunshine and flowers.

Mineral Resources. The mineral resources of the West are just beginning to be developed. Hundreds of millions of dollars are yet to be taken from Western mines to swell the rushing current that is already flowing through the channels of commercial activity.

Unusual Activity. Unusual activity is noticeable all along the Northern Pacific route from St. Paul to Seattle and Portland. New towns are springing up and thousands of acres of new land are being brought under cultivation. Land values are going up, and those who are fortunate enough to be on the ground will soon become wealthy. Irrigation is fast blazing the way for civilization through regions that many believed could never be reclaimed.

Of Interest to Manufacturers. When American manufacturing first assumed importance, business conditions were in a state of solution—all were upon the same basis, and all were operating on about the same system. Soon certain lines found a new means of adding emphasis, and advertising commenced. Since then business methods have been in a state of evolution. The source of the river of trade has been found in the consumer, and it flows straight from him through the dealer, the traveling man and the jobber to the factory. Formerly it was supposed that the current ran in the opposite direction. Many are still working against the stream and making slow headway. Reverse your plan. Argue your case before the consumer; convince him of the value of your product. Awaken his interests; secure his demands. You will find the force of the current that flows from him compelling to the dealer and the jobber and profitable to you. This means permanent trade in ever-increasing volume and independence of business conditions for you.

Brilliant Man Gone. The sudden death of Mr. John Saltar, Jr., on July 12th deprives the engineering world of one of its most active members. Mr. Saltar was a graduate of the Rensselaer Polytechnic Institute of Troy, N. Y., class of '67.

Upon graduation he accepted a position as civil engineer with an Eastern railroad, later being appointed city engineer at Saratoga, N. Y., where he served for some time, giving much satisfaction. Later his services were secured by the government of Ecuador, where he was given charge of important works going on at that time, upon the successful completion of which he again turned his attention to railroad work in this country, finally accepting a position with the North Chicago Steel Works. This position he resigned in 1881 to ac-

cept the management of the Western department of the Otto Gas Engine Works of Philadelphia. About seven years ago he was elected president of the company, which position he held at the time of his death.

Under his efficient management all the larger sizes of the Otto engines have been perfected and placed on the market.

The name of John Saltar, Jr., is probably best known to the engineering world, however, as the inventor of the submarine engines now being used in all the submarine boats throughout the world.

Mr. Saltar was an active member of the Masonic order and of the Western Society of Mechanical Engineers.

Interment took place at Rockford, Ill., the place of his birth.

Agriculture and Public Schools. Agriculture in its highest form has been the object of great attention from legislators for the past few years, and there is now scarcely a State or Territory in the entire union that is not able to claim

the honor of possessing an agricultural college or university. Heretofore, however, it has never seemed to enter the minds of the law makers or pedagogues to install agriculture as an essential study in the grade schools of the State. Just as long as they maintained an agricultural college for those who desire to fit themselves for the profession of farming they considered their part in the educational scheme had been well performed. This age of progressiveness is not satisfied with splicing in a little of agriculture for grown-up students alone, but is insisting that the beginners in town and country schools alike receive instruction along agricultural lines. It would seem that it is high time the city children be given an inkling of what agriculture means and become acquainted with the more crude facts of the operation of a farm, if no attempt be made to go into details, as is the case at the agricultural colleges where farming is being taken up as a science. Long have the funny papers made the countrymen the butt of the countless jokes that have arisen from his greenness concerning city life, but the farmer has ample opportunity to get back at them when the city boy or the city-raised grown-up goes to the country and attempts to delve into the more simple mysteries of the farm. What a world of silly, yet genuinely inquisitive, questions are propounded by the learned city bred when he lands against a new farm proposition that even the hired man of the place knows from start to finish.

With a modified system of agricultural education adopted in city institutions of learning all this dense ignorance upon the part of the urban resident will be in part done away with. No more will we hear the city man asking how old a yearling is, or confounding

egg plant with the product of the live hen. Some time ago a metropolitan paper told how the Royal cattle show would soon receive the addition of a swine exhibit, and the reporter dwelt lovingly upon the prospect of a magnificent display of "Hereford" hogs. Had the young man been able to have enjoyed the privileges of an agricultural education in conjunction with his stock of city learning and excess of algebra, geometry and Greek, this egregious error would not have been seen in print. It is safe to say that not one city-raised child in ten could tell a field of oats from one of wheat or rye, or knows the difference between the way corn is cut and gathered in, and wheat is harvested and threshed.

**The Pacific
Cable and
Western
Commerce.**

Among the great forces which are materially assisting to uplift the far West the Pacific cable must be given prominent place. Already we can see foreshadowed the vast development of Pacific commerce which is now a certainty, and in promoting that development the cable will play a part scarcely secondary to that of the proposed isthmian canal. The world is now completely girdled by a fairly direct line of telegraphic communication, and of the 25,835 miles of telegraph wire or cable strand more than 14,000, or over half the total line of communication, is owned by Americans and is under American control. From the Azores in the eastern Atlantic to the Philippines the line is American property, and in the Pacific the cable comes to land only at the American stations of Honolulu, Midway Island, Guam and Manila. How closely this marvelous ring of wire binds the world together may be seen from the fact that the total time required for the transmission of a message around the world is only nine and one-half minutes.

So far as concerns facilities of communication, Hongkong and San Francisco are now practically in as close touch as New York and London. The world's traders and merchants are benefiting enormously from this quickening of the means of conveying intelligence from port to port, and for none should it be of greater benefit than for the merchants of the West. Aided by the most direct line of communication from the new world to the Orient, and also by control of an isthmian canal through which commerce from the Atlantic States can be sent direct to the far East, American supremacy in the Pacific should be assured. For sentimental as well as practical reasons, also, the cable promises to be of no little political importance as regards our relations with the island colonies in the Pacific. Washington has been brought into much closer touch with Manila. The "unplumbed, salt, estranging sea" will lose some of its estranging power, now that Uncle Sam can communicate across it directly and without depending on foreign telegraph systems in foreign lands.

EDITORIAL NOTES.

APPROACH of dates set for the National Irrigation Congress and meeting of the American Irrigation Federation leads to intensified interest in reclamation work, and what, if any, legislation is needed to repair the National Irrigation Act.

Also the purposes of the federation may be inquired into, and if, by declared principle or omission, there is anything done or undone to affect or impair its usefulness as a factor in Western development, it needs the remedy now. If practical irrigation men, officials of National and State governments, have suggestions or criticisms, they will be welcome, and will aid in shaping the policy of an institution which the builders hope will have benign influence.

BE it said with no uncertain emphasis that one of the primary purposes of this organization was to maintain to its present high order the standard of character of the molders of the West.

It was noted that some of the factors of National Irrigation had, by reason of sudden accession to power, forgotten that in the West were many thousand irrigators, who had carved homes and created myriad green spots amid barren wastes. Had turned rivulet and river from frequented channels over and upon thirsty soils, and saw the magic rise of bower and grove, orchard and vine.

WHETHER by accident or purpose, men like these have suffered by the advent of federal irrigation. If necessity for larger usefulness compelled an occasional absorption, little blame could attach, but when technical interpretation or misconstruction of law is sufficient basis to rob a pioneer of the fruits of his industry, the incident gives rise to a resentment at the intrusion.

Down in the Imperial (California) country is an unfortunate condition brought about by similar intrusiveness. A. H. Heber and others were associated in reclaiming a large area about the Salton Sea. Ten thousand people in only a short period were induced to settle on the areas. The reclamation service enters, and private enterprise stops—compelled by claims of federal engineers to both water and the lands to be reclaimed. In order to retain privilege to water lands already developed, Mr. Heber was compelled to go to a foreign land—to Mexico—and take out an appropriation there, and convey it across the line to water American lands. Fortunately for private interests here, the topography—and contiguous Mexico—intervened to save a strictly American enterprise from complete obliteration. The overflow of the Colorado and losses

incident are in a measure due to the paralyzing effect of the reclamation service as now administered upon private interests then at work.

If these incidents (this is only a prototype) are due to imperfect statute, let the next Congress at Boise point out the defects and suggest the remedy.

IMMEDIATELY after the last meeting, at Portland, specialized instruments of the press were induced to say "that in all probability it was the last of any importance." This and kindred statements by erratic parasites of more or less consequence were circulated as bulletins by the "National Irrigation Association," an organization that has pirated upon the congress so long that the congress itself found it necessary to condemn its processes by the stamp of its disapproval.

FRIENDS of the congress and of irrigators have in the new champion, the American Irrigation Federation, both voice and opportunity. This institution hopes not to stand as an antagonist of any particular branch of irrigation, but as a friend to all considerate effort for Western development. Its anticipations include an amalgamation of all Western endeavor. It hopes by wise counsel that it may prove an intelligent and fair adjudicator of opinion.

THEREFORE the IRRIGATION AGE urges a full attendance at meetings at Boise, from September 1 to 8, which will include formation of a permanent basis for the federation and the deliberations of the congress.

The date of opening bids for power machinery in connection with the Williston irrigation project, North Dakota, has been charged from July 9 to August 14, in order to give the manufacturers an opportunity to fully examine detailed plans and specifications.

A contract has been executed with the Elephant Butte Water Users' Association and the El Paso Valley Water Users, Association to secure to the United States the cost of constructing the Leasburg diversion dam and canal, Rio Grande irrigation project, New Mexico.

The order withdrawing the following described lands in the State of Wyoming in connection with the Shoshone irrigation project has been vacated, and the same has been temporarily reserved for forest planting: Sixth Principal Meridian, Wyoming, T. 55 N., R. 98 W., NE $\frac{1}{4}$ NW $\frac{1}{4}$ lot 52, and N $\frac{1}{2}$ SW $\frac{1}{4}$ and SE $\frac{1}{4}$ SW $\frac{1}{4}$ lot 55. The usual requirement of publication is waived in this instance.

RAPID WORK AT SHOSHONE.

While on a flying visit to Washington to present some important matters to the department, Mr. H. N. Savage, supervising engineer, gave the following interesting details regarding the great Shoshone Reclamation project:

"Work on the two principal structures in connection with this project has now assumed an interesting stage. The temporary works for the great Shoshone dam, which is to be the highest in the world, have been completed so far as possible and are now handling the annual flood. A tunnel 500 feet long has been driven through the rock ledge along the dam site, and a temporary dam has been completed across the stream 1,000 feet above the tunnel. A flume takes the water from this temporary dam and conducts it to the tunnel. The contractors are also damming the permanent spillway tunnel. This is located 240 feet above the bed of the stream and has a cross section of 20 feet square, and will have a discharge capacity of 20,000 cubic feet of water per second, ample provision being thus made for handling the greatest flood the river can produce.

"The big plant for crushing the rock and sand, all sand for the masonry work being brushed from the granite, and for mixing the concrete and also for excavating and handling the material from the dam site, is being erected. Two Lidgerwood cables, each having a span of over 1,000 feet, are being assembled and will be erected as soon as the flood will permit. Cement is being hauled from Cody Station, eight miles away and stored at the dam site, every provision being made to commence excavating and construction work on the main structure at the earliest possible date when the flood shall have subsided sufficiently to permit.

"The water impounded behind the Shoshone dam will be first conducted sixteen miles down the main channel of the river and then diverted by means of a tunnel three and a half miles long out upon the land to be irrigated. This tunnel is ten feet square in cross sections and will have a capacity of 2,000 acre-feet of water every twenty-four hours. Construction work is being rapidly pushed. About 400 men are now at work, the nature of the material encountered being exceptionally favorable for rapid excavating. The soft sandstone can easily be drilled by the use of coal boring augurs. These are driven by compressed air. Frequently a hole six feet in depth is driven in six minutes. The tunnel was located with special reference to rapid construction. Ten headings have been opened up and work is being conducted in three continuous shifts. Two concrete mixing plants have been erected and the tunnel is being lined as rapidly as it is driven. While active construction work was not begun until December, 1905, the contractor expects to complete the three miles and a half of tunnel by February 1, 1907, and present progress indicates his ability to do so."

Garland Canal—Bids for the Garland canal, which is an extension of the Corbett tunnel, were opened last month and advertisement will be made at once for the structures along this canal. The engineers are now making final location for the lateral distribution system to cover the first 30,000 acres, the line being situated in the vicinity of Garland. In locating the main canal an opportunity for providing domestic water supply for the towns likely to spring up along the line of railroad has been found. Provisions will be made whereby an abundant supply of domestic water can be had at a nominal expense whenever the requirements exist.

By a premaure explosion in Heading No. 1 of the Gunnison tunnel, Uncompahgre irrigation project, Colorado, one laborer was killed, two severely and four slightly injured. The explosion occurred while loading the holes. The cause is unknown, but possibly was due to carelessness in putting the dynamite into the drill holes prepared for the purpose. This heading started beneath the level of the Gunnison River and is being dug with slightly descending grade into the Uncompahgre Valley. It is in granite and has progressed for about three-quarters of a mile at a rate of from ten to twelve feet a day. The total length of the proposed tunnel is about five miles.

Among the more recent orders taken for its levels by the Bostrom-Brady Manufacturing Company, 53 $\frac{1}{2}$ West Alabama street, Atlanta, Ga., is one from the Isthmian Canal Commission to be used in connection with its work on the Panama Canal.

\$2.50 will secure for you one year's subscription to THE IRRIGATION AGE and a finely bound volume of the Primer of Irrigation which will be sent postpaid in a few months, when volume is completed. The Primer of Irrigation will be finely illustrated and will contain about 300 pages. Send post office or express money order for \$2.50 and secure copy of first edition.

THE UPLIFT OF THE IRRIGATED WEST

THE LAND OF OPPORTUNITIES

BY JOHN EDWARD BUCK

SPOKANE, WASH., July 17, 1906.—The journey from St. Paul to Spokane is always an interesting one, but especially so at this time of the year.

The West is already a wonderful country—a country of marvelous resources—and irrigation is giving an impetus to the uplift of the Western States that will carry them well to the forefront in commercial importance. Between St. Paul and Portland the Northern Pacific Railway passes through Fargo, Jamestown, Billings, Livingston, Bozeman, Helena, Missoula, Spokane and the great Palouse country, Seattle, and terminates at Portland. Many other important points are reached by spurs running out from the main line. Yellowstone National Park, Butte, Anaconda, Stiles, Lewiston, Walla Walla and Pendleton are among the other interesting points that can be reached by the Northern Pacific route, one of the world's greatest transcontinental arteries of commerce. The first two towns mentioned are in North Dakota, while the others are in Montana and Washington.

The irrigated belt proper may be said to begin at Billings, Mont., and all the region round about gives tangible evidence of how the benign influence of water will transform parched and seemingly barren waste lands into a veritable garden; and what is true of Billings in this respect is also true of every other point along the route where irrigation is practiced. Luxuriant crops of cereals and fruits are grown—and how beautiful are the flowers and grass! Ingalls must have been in an irrigated region when he wrote his beautiful tribute to grass:

"Grass is the forgiveness of nature—her constant benediction. Fields trampled with battle, saturated with blood, torn with the ruts of cannon, grow green again with grass, and carnage is forgotten. Streets abandoned by traffic become grass-grown like rural lanes, and are obliterated.

"Forests decay, harvests perish, flowers vanish, but grass is immortal. Beleaguered by the sullen hosts of winter, it withdraws into the impregnable fortress of its subterranean vitality, and emerges upon the first solicitation of spring.

"Sown by the winds, by wandering birds, propagated by the subtle horticulture of the elements which are its ministers and servants, it softens the rude outline of the world. Its tenacious fibers hold the earth in its place, and prevent its soluble components from washing into the wasting sea.

"It invades the solitude of deserts, climbs the inaccessible slopes and forbidding pinnacles of mountains, modifies climates and determines the destiny of nations. Unobtrusive and patient, it has immortal vigor and aggression.

"Banished from the thoroughfare and the field, it bides its time to return, and when vigilance is relaxed, or the dynasty has perished, it silently resumes the throne from which it has been expelled, but which it never abdicates.

"It bears no blazonry of bloom to charm the senses with fragrance or splendor, but its homely hue is more enchanting than the lily or the rose.

"It yields no fruit in earth or air and yet, should its harvest fail for a single year, famine would depopulate the world."

Just to give the reader some idea of what a town like Billings can do in the irrigated belt, I will mention the fact that 600,000 pounds of wool were marketed



Entrance to the Cascade Mountains.—Northern Pacific Railway.

there in a single day—July 16, 1906—the value of the wool being in the neighborhood of \$135,000.

Inasmuch as our space is limited, I will pass to Missoula, and what is to be said of Missoula may be taken as being representative of all other towns in the irrigated region. Missoula is situated at the base of

the western slope of the main range of the Rocky Mountains. It is entered from the east by way of Hell Gate canyon, through which passes the main line of the Northern Pacific route, treading the banks of the beautiful Missoula River, which empties into the majestic Columbia. The general aspect at Missoula is most striking—the rock-ribbed hills, the snow-capped mountains, the wide plains, the fertile bottom lands, the mountain streams, creeks and rivulets, all contribute toward making the city's environment picturesque. Missoula has good orchards, natural parks, wide streets and pretty driveways. The people are hospitable, and the standards of culture are high. It is the home of the State university, of academies and colleges; it has fine clubs, social and musical organizations and churches.

from the early methods, break their large tracts into small ones and convert them into crop-producing fields.

Diversified farming has become more profitable and popular with each succeeding year, but in an endeavor to cultivate orchard tracts many people have overlooked market gardening, and therein lies a great opportunity for the industrious farmer. The city of Butte alone—the great mining camp—will consume all of the product raised within the valleys, and at prices that will make the farmers' occupation most profitable. Celery is raised in abundance and in paying quantities.

In the establishment of creameries there is ample scope for lucrative incomes. All of that portion of the State east of Missoula supplies a ready market for more than may be contributed from the productive western portion. The Missoula and the Bitter Root valleys excel



Part of the Canal of the Spokane Company, near Spokane, Wash.—Great Northern Railway.

Missoula is the distributing point for all of western Montana—the Bitter Root Valley to the south, the great Flathead Reservation to the north, the rich mineral section of the Coeur d'Alenes west to Idaho, and the tributary Big Blackfoot and Clinton districts north and east. It has imposing business blocks, wholesale houses and retail stores that would reflect credit upon a town much larger than Missoula. The population is about 10,000.

Since irrigation has wrought such wonderful changes in the State, diversified farming has gained a prominent place among the various pursuits. Time was when the big ranches, with thousands of head of cattle, sheep and other live stock roaming upon them, were considered the thing, but conditions are entirely different now. There is a natural inclination upon the part of the oldtimers, as well as the newcomers, to depart

in their dairy products, and the returns from this branch of the farming industry have proven it a most profitable one, and there is a popular tendency to increase the size of the herds, as it has been found that there is more ready money in this than any other farm department.

It is no uncommon thing for farmers to realize \$575 from ten cows in twelve months, and in a number of instances these figures have been surpassed. A herd of Bitter Root cattle, twenty in number, during a year showed the following results: Butter, 6,032 pounds, at an average price of 29½ cents per pound, bringing in the munificent sum of \$779.44. Besides this the owner had 112,420 pounds of skimmed milk, which is valued at 30 cents per hundred weight, as fed to hogs, calves and chickens. This is but one of many instances.

At present there is only one creamery at Missoula

and the Bitter Root Valley, and in this particular there are excellent opportunities for people with a limited amount of capital.

While Montana boasts with a pardonable pride in having the greatest mining camp in the world, her wool industry is second to none in the Union. According to official government reports the year's clip is given as 33,043,500 pounds. Next to Montana comes Wyoming, with a total clip for the corresponding period of 32,100,000 pounds, while Oregon is third with only 15,635,150 pounds. The number of sheep in Montana at shearing time in 1904 was 5,255,000 as compared with 4,681,000 in 1903. The Montana clip the last year, while not so large as in previous seasons, proved to be more valuable than that of most any other State, and brought prices 20 per cent higher than in Wyoming.

most empires in themselves. Some of them are greater in area and resources than entire States. The only things in which they are not equally great are population and development, and these are being rapidly provided by the great influx of capital, immigration and irrigation.

In 1905 the Spokane country produced 50,000,000 bushels of wheat—a quantity sufficient to feed 10,000,000 people with bread—and it has the resources to provide an equally great population with almost every other need and comfort of life—but aside from lumber and wheat and fruits, which find outside as well as local markets, the country as yet does not supply the requirements of its 500,000 population; and in this connection it may be noted that Japan, a country having an area of only one-fifteenth greater than that of the



Fruit Orchard—Washington—Under Irrigation.—Great Northern Railway.

According to the official report of Dr. R. A. Ramsey, chief inspector of the Bureau of Animal Industry, Montana and the Dakotas are the largest sheep raising regions in the Union. From Montana alone during the last six months of last year 1,000,000 sheep were shipped. In cattle shipments South Dakota was in the lead, with 280,793 cattle, while Montana was next with shipments making a total of 150,511. Montana cattle are known the world over. Almost all during the year, except in the most easterly portions of the State, where the winters are severe, livestock may be permitted to remain on the ranches most all of the winter.

The Spokane country embraces an area of 15,000 square miles and includes all of the State of Washington east of the Cascade mountains, the northeastern portion of Oregon, northern Idaho and a portion of western Montana. So vast is its extent that it has become known as the Inland Empire. Within this great territory are other countries, with boundaries defined by no fixed lines of demarkation, yet distinct in character, and al-

Spokane country, and with less than one-tenth of its land surface available for cultivation, supports nearly 50,000,000 people, or 100 times the present population of the Inland Empire. Producing the finest dairy and poultry products in the world, the entire output of the Spokane country is less than sufficient to meet a scant half of the local market requirements. This is due in large part to the great percentage of the population that is engaged in the lumber and mining interests, which represent a yearly output of \$25,000,000 in minerals and 250,000,000 feet of lumber.

Comparatively speaking, these industries are still in their infancy, the mineral districts having been little more than scratched, while more than 300,000,000 of feet of the best timber in the world await the lumberman.

Of the entire West it may be said that everywhere prosperity reigns supreme. Bountiful crops are being harvested and the future never gave greater promise of better things. So prevalent is the general good feeling

—for it permeates every walk of life—that one is predisposed to invoke a thank offering from the lines of the poet:

"Grateful and lovely, thro' the leafy glade,
When day is at its sultriest, heaviest heat,
When birds scarce twitter in the noontide shade,
And the slow kine seek out some cool retreat,
Comes the rich Mother of the harvest sheaves,
Bearing her first-fruits on her ample breast;
Speared barley, wheat and grapes in tinted leaves,
To lay them on God's altar, ripe and blest—
Thank-offering to the Bountiful, Who gives
The fertile sunshine and the soft'ning rain;
The Father, Lord, of everything that lives,
Without Whose blessing man would sow in vain.
Look up, O Mother! holy are thy tears,
And sweet thy hymn of praise in heavenly cars."

instruments there are the slow puffs of the locomotives in unison and then alternately going up steep grades and around sharp curves, followed by the quick puffs descending the grade on the other side; the winding rivers that thread their way through seemingly endless stretches of prairie, resembling majestic ribbons of steel where they cut through the Rocky Mountains—the lonely houses, treeless regions, the rumble of the train in tunnels—and most beautiful and picturesque perhaps of all is the reverberating echo of the locomotive whistle among the pine-clad canyons, the sound repeating itself ten or fifteen times until it is lost in the distance; and the dancing surf of the Pacific would be an appropriate finale.

Every transcontinental train is a unit of civilization in itself. The train is made up of about twelve coaches and from two to three engines—large ones—



Harvesting Alfalfa in Colorado—Denver & Rio Grande Railway.

People in Spokane are getting rich rapidly. Hustle and bustle are noticeable on every hand. The irrigated West is being given an uplift that is causing nearly everybody to sit up and take notice—and irrigation is doing the boosting.

From Livingston to Trout Creek—a distance of some 500 miles—we rode among the Rocky Mountains, where, towering away to cloud-land, stand mighty adamantine sentinels. Upon these gigantic slabs of rock—the poet calls them "the gods' pallet"—are mixed the paints that color the rainbow, tint the cloud pictures with which the early evening sky is hung, give the bright green to earth's carpet, the deep blue to heaven's canopy, and the silvery sheen to the far away stars.

From New York to Seattle is a grand symphony. It seems strange to me that Sousa has never composed the march "Across the Continent." It is a theme with limitless possibilities. First we have the rolling uplands of the Atlantic States, then the gentle undulations of the Allegheny hills, followed by nearly 2,000 miles of level prairie, extending through Ohio, Indiana, Illinois, Iowa, Minnesota and the Dakotas. Here the staccato begins with now and then a rugged hill lifting its head above the vast sweep of magnificent distances, while a range of blue hills can be seen encircling the far-away horizon. The Rocky Mountains form the crescendo movement—and what a crash of heavy brass and sounding cymbals could be thrown in here! The reed instruments could portray the herds of cattle and sheep feeding on the lower hills, the unfamiliar flowers and the murmur of the mountain streams. For other

moguls. It lives, moves and has its being—chiefly moves—regardless of what the remainder of the world is doing, except the other trains moving over the same road. Aboard the train every conceivable subject is discussed pro and con. Engineers map out irrigating projects; telegrams and letters are dictated to stenographers written on typewriters and sent to every part of the known world; weighty governmental problems are worked out; officers of foreign powers study our resources and strength; our own officers move from one army post to another; the Russo-Japanese campaign is fought over again in every detail from the battle of Yalu to the Portsmouth conference—in brief, the men who travel on the transcontinental trains are in the main men who do things.

Among the distinguished guests aboard our train were Major Cheveer, U. S. A., a brilliant and dashing cavalry officer, who has seen much service on the frontier, in Cuba and the Philippines; F. W. Gilbert, general superintendent of the Northern Pacific Railway Company, who was accompanied by his private secretary and worked unremittingly throughout the whole journey; E. E. Dildine, assistant superintendent of telegraphs for the Northern Pacific Railway Company; C. A. Alther, capitalist, Minneapolis, Minn.; A. C. Lewis, representing Woodcraft of Cincinnati; M. M. Baker, capitalist, Chicago, and Lieutenant-Colonel Sanborn, of the British Army, who led a regiment of dragoons against the Boers in the South African campaign. We were a merry little band, and the name of our car was "Mandan."

THE TWIN FALLS EXPERIMENTAL FARM.

BY A. M'PHERSON, SUPERINTENDENT OF AGRICULTURE.

The Twin Falls Experimental Farm was established the tenth day of May, 1905. The primary object of establishing the farm was for the purpose of demonstrating the proper methods of irrigating on the Twin Falls tract.

Later, the idea was somewhat enlarged by adding to it the feature of an experimental farm in the true sense of the word. Although the season was pretty well advanced, thirty-nine different crops were planted, and the results were far beyond the expectations of the company or its employees.

When the work was begun on the farm we dug deeply into the ground in order to determine the amount of moisture in the soil. The first eighteen inches contained some moisture, but after going down three feet it (the ground) became almost entirely dry, and by digging ten feet the ground became perfectly dry. This demonstrated the fact that there was not sufficient moisture in the ground to properly germinate the seed or to furnish sufficient moisture at a proper depth, especially for the deep-rooted crops later in the season. Consequently, all the ground was thoroughly irrigated before being planted, and was saturated to a depth varying from six to ten feet. After the crops were planted very little irrigation, comparatively speaking, was necessary. For instance, potatoes were only irrigated twice during a period of twelve hours each time, and produced 330 bushels per acre. Corn received the same amount, and produced forty and a half bushels to the acre. This on entirely new ground, which was in sage brush at the date of beginning.

After the first saturation no effort was made to keep track of the water used. We simply used the amount thought necessary for crop production.

The contract for the Twin Falls Land and Water Company with the settlers on the Twin Falls tract calls for one-eightieth of a cubic foot per second per acre continuous flow during the irrigating season. Therefore

the farm in order to measure the waste water from the farm.

Mr. Elias Nelson, representing the Bureau of Irrigation and Drainage Investigation, added an evaporating tank. Measurements are being conducted under Mr. Nelson's supervision, the foreman on the farm keeping track of all measurements for him. The idea is to measure the water coming on, checking the different devices, measuring water going off as drainage; also from the tank, the evaporation, the difference being the amount of water approximately used by the different crops on the farm.

Before irrigation was begun some preliminary tests were made by Mr. Nelson, with the following results:

ALFALFA PLAT.

	Depth.	Percentage of Water.
<i>Before</i>	: 1st ft.	7.61
	: 2nd ft.	15.14
	: 3rd ft.	17.82
One day after	: 1st ft.	19.67
	: 2nd ft.	20.95
	: 3rd ft.	20.11
One week after	: 1st ft.	11.69
	: 2nd ft.	17.42
	: 3rd ft.	18.78

It should be borne in mind, however, that last fall, before the winter set in, the ground was given a thorough soaking. The first table shows before irrigation, the second one day after, and the third one week after. It will be noted, by looking at these tables that in the third foot there was comparatively little variation in the amount of water contained in the soil, either before or after irrigation. No doubt the water had percolated more deeply into the soil. This shows how retentive of moisture soils in the Twin Falls tract are. These tests will be made all during the season, both before and after each irrigation.

In comparing these tests with the results as shown by the experiment station in Utah it will be seen that the soils on the Twin Falls tract are extremely reten-



Harvesting Alfalfa in Colorado—Denver & Rio Grande Railway.

it was thought advisable to measure the water being used on the farm, as well as the amount of waste water. In order to test the different systems of measurements, water is being run through boxes having the different measuring devices—namely, the miner's inch, the weir measurement, and the United States government register. Another register is installed at the lower end of

tive of moisture. In the minds of some who are not familiar with conditions here, this would seem to indicate that the soil might become water logged, but such can not be the case on account of the natural drainage on the tract, as probably every half mile or less there are deep coulees or canyons, varying from three feet to one hundred feet in depth to bed rock.

THE FOURTEENTH NATIONAL IRRIGATION CONGRESS.

The fourteenth national irrigation congress, which meets at Boise, September 3 to 8, is the only meeting of national importance to be held on the Pacific slope during the present year. Chairman Eben E. MacLeod, of the Western Passenger Association, has notified the executive committee that rates for the congress would be determined at the Minneapolis meeting of the association July 31.

On account of the fact that this is the only opportunity for attracting travel to the great West, it is expected that the railroads will make unusual concessions for this occasion, and that the rates given will be such that all who contemplated making a Western trip will take advantage of this opportunity.

The general impression prevailing in the East is that it requires large land holdings in the West to enable farmers to be prosperous. This was the case

generally known that agriculture is as certain in results as manufacture, when carried on through irrigation, and that neither drouth nor floods endanger the certainty of the expected yield.

The cause of the numerous inquiries from the home-seeking class is the unprecedented interest taken in the success of the congress by immigration societies and bureaus, and the immigration departments of the railroad systems running through Chicago and St. Louis. The great irrigation enterprises being carried on in the inter-mountain States will provide homes for many thousand families, relieving the congested condition of the over-crowded East, and every effort is being made to inform the people of the opportunities waiting the home-seeker.

The Boise session of the congress is to constitute a great school for irrigation. Scientific and professional men will discuss and analyze advanced theories, engineers of national character and reputation will give the solution of the many engineering problems that



A Familiar Western Scene.

with the pioneers of the middle Western States, and it seems incredible to them that a twenty-acre irrigated farm is amply sufficient to provide a family with all the comforts of life, leaving a surplus at the end of the year, and many are coming to investigate and learn how it is accomplished.

Although more than a month will elapse before the congress is to meet, delegates to the number of over 1,000 have been appointed from different sections east of the Rocky mountains, and an average of 100 letters a day are being received at headquarters, asking for general information concerning the congress and the opportunities to be had for learning as much as possible of irrigation methods, size of farms, capital required, character of crops produced, and the revenue to be depended upon by the irrigationists, for it is now

have been worked out, and the practical irrigators will show in a practical way what is accomplished by the results on exhibition.

The general Government has loaned nearly \$40,000,000 for the purpose of reclaiming arid lands and providing homes for the people. The loan was made through an act of congress approved by President Roosevelt four years ago. At the Idaho meeting the Government is going to be asked to add \$100,000,000 more to the loan made to its citizens for the more rapid completion of the works now under construction. Senators and members of congress are the real trustees of the Government in the loans made, and they are coming to investigate the conditions of the security which reclamation is giving to insure its repayment.

The investigation will show that the land in the

desert State was originally without value, because it produced nothing. At a cost of \$20 to \$30 per acre, advanced by the Government for water, the land yields a certain crop the first year of cultivation worth \$50 an acre, and finds ready sale at \$100 an acre. With the security thus offered there can be no good reason advanced why the Government should not loan the additional \$100,000,000 required to hurry to completion the great works now under construction.

Statesmen, capitalists, manufacturers, business men, engineers and irrigationists, immigration and colonization societies, home-makers and home-seekers, all to the number of 2,000 or more, will join in the great movement at the Boise session of the national irrigation congress.

A special train will be made up at Chicago for the delegates from the Eastern States to the national irrigation congress to convene at Boise, Idaho, September 3 to 8. Vice-President Fairbanks and his party will occupy one of the cars. The special will be known as "the vice-president's train."

A State irrigation congress was organized at Oklahoma City, Okla., a few days ago, the members of which passed a resolution to attend the national irrigation congress, at Boise, Idaho, September 3 to 8, in a body. The new State of Oklahoma has a fund of nearly \$1,000,000 for the irrigation of the lands in the Western portion of the State, where the rainfall is insufficient. The Oklahoma delegation will occupy two special cars.

Idaho has 20,000,000 acres of merchantable timber and 25,000,000 acres of mineral lands. These industries will be fully exploited at the Fourteenth National Irrigation Congress, to meet at Boise September 3 to 8, to demonstrate the unlimited market for farm products.

The fruit and sugar beet raisers of Colorado and Utah have served notice on those in Idaho that they are coming to the exposition to be held in Boise during the National Irrigation Congress, September 3 to 8, with the intention of carrying away the big prizes. Oregon and Washington have served a similar notice as regards fruit. The Idaho producers are getting busy, and the indications are that if any one of the prizes leave the Gem State the winners will have broken all records as to size, quality, flavor and appearance of the exhibits made. The exposition will be attended by the representatives of thirty-eight fruit commission houses of the eastern cities, from which the judges will be selected to make the awards.

A contract was closed a few days ago for \$75,000 worth of Idaho prunes, to be shipped to London and Glasgow. The first carload will be packed and loaded into a refrigerator car during the session of the National Irrigation Congress, to be held at Boise, September 3 to 8, and the fruit will be inspected by the delegates of the congress.

The subject of colonization is one which will receive marked attention at the coming session of the National Irrigation Congress, which meets at Boise, Idaho, September 3 to 8. Until recently the importance of this feature of the works of reclamation has not been appreciated by those who attend the congress. Through the projects of the government reclamation service and the vast number of irrigation enterprises being carried out by private capital, opportunities for home-making have increased faster than the natural flow of immigration. The immigration agents connected with the

various railroad systems of the west and representatives of colonization societies are coming to the congress, and will devote much attention to this subject. An effort is to be made to secure state legislation creating immigration bureaus in the different States of the arid regions. It is considered to be the duty of the State governments to provide ways for settling lands as fast as they have been reclaimed.

Among the prominent delegates coming to the National Irrigation Congress, which meets at Boise September 3, is Mr. F. H. Buhl, a multi-millionaire of Sharon, Pa. Mr. Buhl has made larger investments in irrigation projects than any other capitalist in the world. He contributed considerably more than \$1,000,000 of his own capital to the Twin Falls project, which resulted in immense profits to him. Though no longer interested in Idaho enterprises, his presence at the congress is an indication that he is ready to contribute to its success with his advice and experience, and it is not unlikely that while in the Gem State he will make other investments on a large scale.



First Building Erected in Twin Falls, Idaho.

Among the States of the East to send delegations to the National Irrigation Congress, which meets at Boise September 3, Pennsylvania will be the most numerously represented. This is accounted for by the fact that irrigation is being practiced to a considerable extent in the Keystone State. A recent report of the Department of Agriculture states that "in the State of Pennsylvania there is a great deal of irrigated meadow land, and the testimony of the farmers is given to show that by means of irrigation the crop is in every instance doubled and in frequent case trebled. In Lancaster, Berks and Lehigh counties the experience of twenty-two farmers with irrigation is given by the department, and each of them says irrigation brought the yield of hay from his land up from one-half a ton or a ton per acre to two tons per acre.

President Bumstead, of the Colorado State Beet Growers' Association, has notified the board of control that his organization will endeavor to make a winning contest for the \$500 solid silver loving cup that has been donated by President Havemeyer for the best exhibit of

sugar beets at the National Irrigation Congress, to be held at Boise September 3 to 8. Similar organizations in California, Utah, Washington and Idaho have given the same notice, and the prospects are that the greatest exhibit of sugar beets ever made will be shown on this occasion. The raising of sugar beets has advanced more rapidly than any other industry during the past few years and promises to become a more important crop than fruit culture in the near future. Idaho has built five beet sugar factories during the past five years, costing \$1,000,000 each, and two more are now under construction.

Among the social entertainments that have been provided by the board of control, which will prove a delightful surprise to the delegates attending the Fourteenth National Irrigation Congress, at Boise September 3 to 8, is the symphony concert, given Tuesday night, September 4. Boise has a symphony club numbering fifty amateur and professional musicians. The club has generously volunteered to entertain the visitors with a concert that will be an unlooked for surprise, affording an opportunity to the visitors to appreciate the character of citizenship, education and refinement to be found in Idaho's capital city. The concert will be given at Riverside Park theater, which has a seating capacity of 2,200. A classical program will be rendered.

The Southern States bordering on the Atlantic Ocean and the Gulf of Mexico have advised the executive committee that they will be represented at the Fourteenth National Irrigation Congress by their most expert engineers and scientific agriculturists. These States are more interested in reclamation than irrigation. They are troubled with too much water and study reclamation through drainage propositions. Their delegates will submit drainage problems to the engineering section, which will prove an interesting feature. The Southern States contain millions of acres of valuable land if proper methods can be found to drain them of their surplus water. Much valuable information along these lines will be obtained at the Boise congress.

One of the most important features of the Fourteenth National Irrigation Congress, which meets in Boise, Idaho, September 3 to 8, is the section of the work devoted to engineering problems. The Orpheum Theater has been secured by the board of control for the use of the engineers. A stereopticon will be used in which to illustrate many of the problems to be presented and discussed, the foremost engineers and irrigationists of the United States taking part. Chief Engineer Newell and a large number of the district and consulting engineers of the reclamation service, together with the State engineers of the Western States, will be present, and greater accomplishments are expected from their discussions than have ever been obtained at any preceding congress. Engineering problems that have been considered impossible will be illustrated among the accomplished facts, and the manner in which difficulties have been overcome will be fully shown on the canvas. This feature is attracting expert irrigationists from all parts of the world.

Some very interesting statistics are being compiled by the State engineers and agricultural departments of the sixteen States and Territories comprising the irrigated area of the United States. These will consist of compilations of statistics relating to the amount of water in the running streams, the amount additional

that can be conserved through storage, and the number of acres of land that are subject to reclamation through irrigation. The showing will be a wonderful exposition of the vast opportunities remaining in the West for profitable investment of capitalists, for future immigration and home-making, for enlarged markets for manufacturers, for extending railroads and other means of transportation, for building cities and creating business. The figures given will be authentic and reliable, and demonstrate to what extent the future holds for irrigation enterprises.

The delegates and visitors attending the National Irrigation Congress, which holds its fourteenth session at Boise, September 3 to 8, will be greatly impressed with the wonderful crops raised by irrigation. At the exposition to be held during the congress every variety of fruits, grains, grasses, sugar beets and vegetable crops will be on exhibition, coming from each of the sixteen States and Territories named in the national reclamation act. One of the great object lessons of this congress is the showing of results; the other will be in



An Irrigation Canal—Denver & Rio Grande Railway.

taking the delegates into the irrigation districts to show in a practical way how the results were accomplished.

Hon. Milton Whitney, chief of the bureau of soils, Department of Agriculture, will be among the prominent department officials of the government at the National Irrigation Congress, to be held at Boise beginning September 3. The investigations carried on by Mr. Whitney's bureau are of the greatest interest to agriculture and horticulture in the irrigated areas of the country.

Hon. T. W. Lee, for many years general passenger agent of the Delaware, Lackawanna & Western Railroad at New York City, has resigned his position and is going to make his home in Idaho. He was invited to attend the National Irrigation Congress, which is to convene at Boise September 3, and deliver an address entitled "Why I Left New York City for Idaho." In accepting the invitation, Mr. Lee writes: "You will readily understand this is rather a pertinent subject, as I might have as good reasons for leaving New York as many a gentleman had for entering Texas. However,

I will earnestly endeavor to be in Boise during the session of your congress, and do my best in explaining my embarrassing position." Mr. Lee will find himself in familiar company during the Boise congress, as he is said to know more public men in railroad, financial, business and political circles than any one, and being an Idaho man at the time of the congress he will constitute one of the special committees on entertainment.

Hon. Addison Bennett, editor of *The Dalles Optimist*, and known as the "Bill Nye" of the Pacific Coast, has accepted an invitation to the Fourteenth National Irrigation Congress at Boise, Idaho, September 3 to 8, and will deliver an address on the subject, "Scientific Versus Real Irrigation." Mr. Bennett has the happy faculty of combining the keenest wit with the best of logic, and his address will be one of the oratorical gems of the congress. The Oregon delegation is coming 500 strong.

Hon. James I. Parker, chief of the division of lands and railroads of the Interior Department, has notified the executive committee that he will be present at the Fourteenth National Irrigation Congress, to convene at Boise, September 3 to 8, and take part in the work of the congress. It has been suggested that in case



Excavating for Irrigation Canal with Steam Shovel.

Secretary Hitchcock is unable to attend the congress in person, he will delegate Judge Parker to represent the Interior Department.

A pleasing departure from the usual plan of giving prizes has been adopted by the board of control at Boise, in the exposition of irrigated products to be held during the National Irrigation Congress, September 3 to 8. In place of awarding gold medals for individual prizes, the board will give handsome solid silver loving cups, appropriately engraved, showing the purposes for which they are given. There will be more than thirty of these, in addition to the four grand sweepstake prizes, which are large cups valued at \$500 each. Many second cash prizes will also be given. Sixteen States and nearly 300 individual competitors have asked for space at the exposition.

The Arid States Exposition of the Products of Irrigation, which will be held at Boise during the session of the Fourteenth National Irrigation Congress at Boise, September 3 to 8, will close with a grand irrigation carnival. Floats representing every product of irrigation will be in the parade, and each of the counties, cities and irrigation districts will be represented by unique characters. Merchants of Idaho and manufacturers will join in the big parade. The occasion will be used to distribute fruits and flowers to the visitors, and the night given over to King Carnival and his followers, who will take full possession of the city.

ECONOMICAL METHOD OF IRRIGATION BY HYDRAULIC RAMS.

For that class of irrigation problems which presents the conditions of a moderate fall of water available for power, and where it is required to raise a portion of the water to a higher level, or even to a series of higher levels, there is no more efficient or appropriate machine for pumping than the Rife hydraulic ram. This statement is true for cases where the waterfall is from 2 to 50 feet, and the rams will deliver, approximately, one-third of the water used two and one-half times as high as the fall, one-sixth, five times, one-twelfth, ten times, etc.

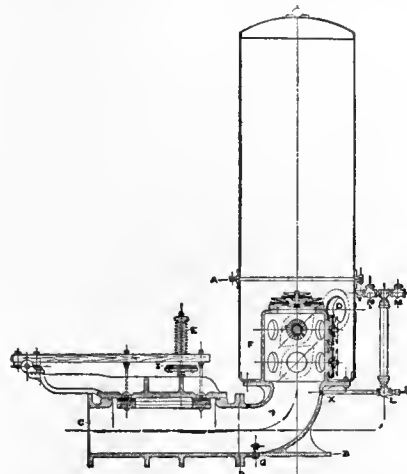


Fig. 1.—Cross Section of Hydraulic Ram. No. 120. Single Capacity 1500 gallons, Weight 3300 pounds.

A Rife hydraulic ram will pump with good efficiency against heads of twenty-five to thirty times the amount of the fall. It is true the efficiency falls off as the ratio between the power head and pumping head increases. At low ratio of about three to one a Rife ram will have an efficiency of over 90 per cent, whereas, at a ratio of twelve to fifteen to one the efficiency will be

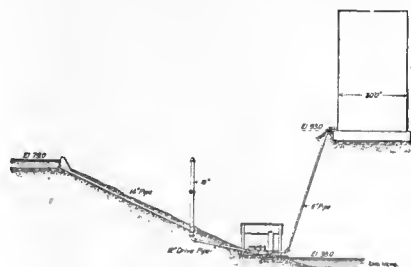


Fig. 2.—Hydraulic Ram and Connections U. S. Coaling Station, Narragansett Bay, R. I.

as high as 70 per cent; and with extreme ratios of power head to force head the efficiency need not fall below 60 per cent.

The general impression of an hydraulic ram is that of the small machine usually used for the supply of a small country house where there is a flow of water available for power of, say, four to fifty gallons per minute and the water used very wastefully, but there is another side to the ram question, as the principle of the machine is such that it permits the highest efficiencies, and when rams are built on the line of good hydraulic engineering, high efficiencies may be easily realized.

There is also practically no limit to the size to

which the Rife hydraulic ram may be constructed. Accounts of many tests with Rife hydraulic rams have been published from time to time in the Engineering Press of recent years, and, in comparison with other forms of pumping machinery, the ram possesses marked advantages, and it is entirely automatic and runs constantly without attention or expense. It is practically without wearing parts, such as require lubrication or frequent adjustments, and is therefore not in need of the care of an attendant. The operation is most reliable, and the repairs are few, owing to the few number of parts which are liable to derangement; it need not be protected from the weather and will work equally well out of doors and not covered, and foundations are unnecessary.

The illustrations show one of the larger sizes of the modern hydraulic rams as built for the United States Government, and also the method of installation at the Naval Coaling Station, in Bradford, R. I. Two of these machines were put in during the summer of 1903 for pumping water into a tank which furnishes fire protection, and also supplies the various buildings on the grounds and vessels which tie up to the dock. Careful tests were made of the plant when completed by Government engineers, and the rams were shown to develop an average efficiency of 90 per cent, as per Government test as follows:

Q, total water used by ram. q, water delivered into stand pipes. H, power head on ram. h, pumping head on ram. Q, 582 gallons per minute. q, 232 gallons per minute. H, 36¾ feet. h, 84 feet. Strokes, 130. Efficiency, 91.25 per cent. Q, 578 gallons per minute. q, 228 gallons per minute. H, 37¼ feet. h, 84 feet. Strokes, 130. Efficiency, 89.06 per cent.

These rams could use 750 g. p. m. each. 582 was all available when tests were made.

A number of such machines have been supplied by the Rife Engine Company, New York City, for irrigation purposes in the South and West, and also to sugar plantations in South America and the Hawaiian Islands.

UNCLE SAM, AUCTIONEER.

A rather unique event is scheduled to take place in southern Idaho the latter part of this month, when Uncle Sam will offer for sale the lots contained in the two town sites situated in the heart of the Minidoka irrigation project.

This project provides for the reclamation of about 130,000 acres lying on both sides of Snake river. The land was all public domain and when the engineers designed the system, they did not neglect the splendid opportunity for establishing an ideal farming community. Three town sites were laid out in the center of the tract on the proposed line of the Oregon Short Line Railway; the towns were platted with wide streets and boulevards, and parks and extensive areas for public buildings were reserved. All the agricultural lands were cut into farms of forty and eighty acres, so that the instant the tract is brought under cultivation it will become one of the most densely populated agricultural communities in the country. Its prosperity is assured by the unfailing water supply, which will be furnished by the big Government canals and ditches, and this prosperity will be reflected in the future success and substantial growth of the towns which Uncle Sam proposes to establish there.

Two years ago the Minidoka country was an uninhabited sage brush plain. The railroad was miles away and it seemed destined forever to serve only as a haunt of the jack rabbit and the skulking coyote. Far below the surface the Snake river cut its way through a canyon across the plain, offering

no opportunity for the pioneer with his simple ditch to lead the water out upon the thirsty soil. Only skilled engineers backed by vast capital could tackle such a proposition as this. Many men without the necessary wherewithal had looked at it, but its great cost had forced them to give it up. With the passage of the Reclamation Act on June 17, 1903, one of these engineers who had joined the Government force rushed a field party to this point and in a single season prepared and presented a set of plans for a comprehensive system of irrigation. They were accepted and bids were asked and contract awarded for construction.

To irrigate this broad expanse of plain, the Snake river must be lifted from its bed, and a dam was laid across the stream at Minidoka Rapids, a great rock fill structure, 30 feet in height and 650 feet long on top, which raised the water surface 47 feet at flood level and backed it up for thirty-five miles. The dam is near completion and will cost nearly half a million dollars. When the immense gates in the diversion channel are lifted, the water will pass into the high line canals on both sides of the river and be led from them through hundreds of miles of laterals to every farm in the valley.

The initiation of this great work was followed by an influx of settlers from all over the country, and soon every farm division had been filed upon. While the Government proceeded with the construction of the dam and canal system, the settlers were busily engaged upon their own buildings. The coming of large numbers of farmers created a market and stores sprang up. An enterprising young man established a newspaper and as if by magic, doctors, lawyers and mechanics of all classes flocked in. The intoxication of creation was in the air. Other newspapers were started, three banks were established, a school was opened and seventy pupils greeted the teacher the first morning. Meanwhile, two lines of steel-like ribbons came creeping over the plain, crossed and passed the town sites, and the shriek of the locomotive was added to the creaking of the derricks as great blocks of stone were dropped into place on the dam.

"The Secretary of the Interior has fixed the date of town lot sale, Heyburn, August 20, Rupert, 27." When this message was flashed over the wires it carried joy to the hearts of the waiting settlers. Scattered here and there in and around the town sites are 122 mercantile institutions waiting for the town lot sale, so that they can move over upon their own property and no longer remain tenants by sufferance of the Government, and on every forty or eighty acre tract a home has been built, so that today a population of over 4,000 awaits the completion of the canals and ditches.

Idaho is famous for its irrigated fruits and fields. The soil and climate are adapted to a wide variety of crops. Owing to the importance of the live-stock industry in this section, alfalfa and other forage crops will always find a profitable market, and all the vegetables and fruits of the north temperate zone may be grown.

With all these manifold advantages, a prosperous future and rapid growth are assured for the new towns. The lots in Sherrer, the third town site, will be reserved for future sale. An important feature in connection with the construction of the irrigation system is the possibility of power development at the dam. This power can be transmitted economically to the towns and utilized for municipal and other purposes.

The optimism of the settlers on the Minidoka project has gone abroad through the enterprising little newspapers which have grown and flourished on the sage brush desert, and ere the waning of the moon hundreds of tenderfeet will "hit the trail" for this land of opportunity.

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THE PRIMER OF IRRIGATION, a finely illustrated 300-page book.	2.00
If both are ordered send	2.50

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112 Dearborn Street, Chicago.

A TOUR OF THE WORLD AWHEEL.

An unusual trip was started the latter part of June by two Moline (Ill.) men, who will make a tour of the world awheel. This trip will take from two to three years, will cover 50,000 miles or more, and will take them through thirty-five or more countries, of Europe, Asia and northern Africa. The trip on land will be made by wheel unless absolutely impossible to do so. The two men who show the usual American vigor are George E. Holt and Lester R. Creutz. They will depart from New York for Liverpool the latter part of June, from Liverpool they will make the circuit of the British Isles, pass through England, Scotland, Ireland and Wales. Crossing to France they will then go northeast to Belgium, Holland, Denmark and Sweden to Stockholm. From Stockholm they will cross to St. Petersburg, thence southwest through Russia, North Germany, France and Spain to Tangiers. During the winter they will pass through North Africa, crossing to Morocco,



GEORGE E. HOLT.

Algeria and Tripoli, crossing the Mediterranean to Sicily. They will then ascend the Italian peninsula and Switzerland, thence to Vienna, thence south through Austria, Servia, Roumania, Bulgaria, Romellia, Turkey and Greece. From Athens they will again cross the Mediterranean and will go as far up the Nile as practicable. Returning to Cairo they will then go through the Holy Land and down the Red Sea, stopping at Medina, Mecca and Aden. They will go by boat from Aden to Persia, and then on their wheels will pass through portions of Persia, Baluchistan, around the Indian peninsula, through Burma, Siamese peninsula to Singapore. From Singapore they will make a side trip to Sumatra and Borneo, thence to the Philippine Islands. From Manila they go to Canton, China. From China they will visit Korea, and from there they will go to Japan. Having visited in the land of the Mikado they will sail for the Hawaiian Islands, and from that point will sail to San Francisco, and thence by rail to the starting point.

During the trip Messrs. Holt and Creutz will represent THE IRRIGATION AGE and prepare illustrated articles for this paper, as well as do special work for various class publications.

Last week we sent in a resolution to the farmers' congress condemning the hocus-pocus methods employed by the forestry service in keeping settlers from going onto reservations for the purpose of cleaning out irrigation ditches and repairing reservoirs as was done on the Grand mesa reserve last summer. It seems that other people have been having trouble along this line and we quote what C. F. Albertson of Eagle county has to say about it: "While building a ditch that headed in a timber reserve I met with no resistance, but after having it completed and my decree allowed according to the state law, a range rider said I would have to get a permit before I could clean it out and run water. I got a surveyor to make duplicate maps and field notes which, when completed, cost over one hundred



LESTER R. CREUTZ

dollars. I then was compelled to furnish a \$2,000 bond for all damages that might incur from it. The papers and maps have been back and forth from Washington four different times, which has consumed two years already. I am now notified that my permit will be allowed as soon as I comply with the law by cleaning out and burning all the dead and down timber for fifty feet on each side of the ditch, which, by the way, runs three and one-half miles through such timber. The lowest estimated cost to clean the same is a thousand dollars. I can not afford to clean up as required, so I may have to move out and leave eight years' hard work. I will say that I believe all timber reserves according to the present ruling a public nuisance. The expensive and stringent rules that have to be complied with to get a permit to build a ditch or reservoir or clean out and maintain a ditch almost puts it out of reach of a poor man to make a home depending on a reservation for its water supply or for grazing cattle."—*Denver Field and Farm*.

MONTANA.

BY C. H. BOYNTON, SECRETARY HELENA BUSINESS MEN'S ASSOCIATION.

No State in the great Northwest will be more benefited by the results of irrigation than Montana. It is already *sui generis*, producing one hundred million dollars per year in minerals, live stock, wool and miscellaneous products, which is a record unequalled by any commonwealth containing only about three hundred thousand people. Yet with this immense and unique production our scanty population is annually sending out of the State from seven to nine million dollars for food stuffs, poultry, hog and dairy products and fruit which can be better produced within our own borders.

streams of Montana to reclaim and continuously irrigate ten millions acres of land, and from the present outlook it will not be many years before all this water is utilized and the arid wastes and semi-arid areas, now only fit for grazing, will be made to blossom as the rose and become the homes of thousands of prosperous and happy families.

That these reclaimed lands in Montana are the most productive in the country, is shown by the official report of the United States Bureau of Agriculture, figures from that report being as follows:

These lands will produce anything that can be grown in the temperate zone, and there are within the State fine markets for all farm and horticultural products, guaranteeing high prices and good profits.

It may be urged by those not familiar with the



A Montana Scene.

That these conditions are abnormal is coming to be appreciated by our people, and steps are being taken to co-operate with the general government in reclaiming the arid and semi-arid lands; private enterprise is being organized to work in the same direction, so that within the next few years it is safe to say that over two million acres will be added to the highly productive agricultural area of the State, and the people of Montana can retain at home the money received from their copper, gold, silver and lead ores, their cattle, horses, sheep and wool, besides exporting some of the products which they now import.

The Government has now under consideration nine great projects for the reclamation of within a few acres of a million in this State, which, when the water is turned on, will be the most productive and profitable of any in the Union. Through private enterprise, already a million acres have been reclaimed by irrigation, and other private and co-operative enterprises are under way which will swell the total as before stated. There is water enough running to waste from the mountain

conditions in Montana that this progress in the development of the agricultural resources of the State will tend to reduce the stock-growing industries. On the contrary, it is susceptible of proof that the output of stock, sheep and wool (in dollars and cents) will be increased, rather than diminished. There has been a great change in this direction from the early days, when stockmen believed that it was better to let their stock run on the range the year around, and that they could better stand a loss of a considerable percentage than to "feed." Now thousands of cattle are fed, regularly, during the winter and shipped as "finished" cattle, bringing top prices, as against the range stock of other years. The same conditions obtain in the sheep industry, and hundreds of thousands of sheep are now given winter feeding, thus making a profitable market for the hay and alfalfa of the ranchers, as well as added profit for the stockmen. In one county in this State, famed for its hay and alfalfa, fifty thousand head of stock are purchased by the farmers to feed and fatten for market, with immense profits.

Up to 1889 but 350,000 acres of land were under irrigation in this State. The census of 1900 shows that at that time there were 951,154 acres reclaimed either through individual effort or co-operative organizations, and this out of 1,697,000 acres under cultivation. The irrigation ditches measured 8,612 miles, and cost \$4,683,073. The total value of irrigation products in the State in 1899 was \$7,230,042.

The projects for reclamation of lands in this State by the national Government are Lower Yellowstone, which will reclaim 67,000 acres, with eighty miles of main canal, taking water from the Yellowstone river in eastern Montana; the Milk River-St. Mary project, to reclaim 250,000 acres in northern Montana; the Marias sub-project to reclaim 200,000 acres in the same section; the Madison river project to reclaim 150,000 acres in the Missouri, Madison, Crow Creek and Prickly Pear Valleys, the section to be reclaimed lying in the center of the State for a hundred miles along the Northern Pacific railway and directly tributary to the splendid markets at Helena and Butte, fifty thousand acres in the Prickly Pear valley lying at the very doors of the capital city, where farmers can market their products without paying tribute to express or railway companies. The Sun River project to reclaim 240,000 acres in Cascade and Lewis and Clark counties; the Clarks Fork to reclaim 60,000 acres in eastern Montana; the Huntley project to reclaim 32,000 acres in the same vicinity; the Fort Custer, in eastern Montana, to reclaim a large area; the Big Horn High Line, in the same section; the Waco-Sanders, in the same section. These projects, when completed, will add to the tillable domain of the State 991,000 acres. Surveys and estimates have been made on all these projects and on the Lower Yellowstone and Huntley projects contracts have been let and the work is under way. Work has also been commenced on the Milk River-St. Mary Lake project. Work will soon be commenced on the Sun River project. On the lands reclaimed under the provisions of the National Irrigation Act, the farm unit will probably be eighty or at the outside 160 acres, to be secured under the homestead laws with the cost of putting on water added.

Among the private enterprises now under way is that of Mr. W. G. Conrad, by which water is now furnished for 100,000 acres in Teton county, which has become thickly settled and a prosperous town (Conrad) has sprung up. Work is under way to furnish water for the irrigation of another like area in the same vicinity, and perpetual water rights can be secured at very low cost. Another private enterprise well under way is that of the Billings Land & Irrigation Company, which, when its ditches are completed, will irrigate 40,000 acres. Ten thousand acres are already under ditch and have been sold to settlers and crops are growing.

Another important enterprise is the reclamation of from 30,000 to 50,000 acres in the immediate front of Helena, by the Helena Power Transmission Company, by pumping by electric power the flood waters of the Missouri. These lands will be extremely valuable, as they are all within driving distance of Helena, where there is a fine market.

In the Gallatin valley the West Gallatin Irrigation Company is irrigating 15,000 acres at a cost to the farmer of \$2.00 per acre, and the Manhattan company has 20,000 acres, with ditches for irrigating, and is offering its lands in small tracts to settlers, including a perpetual water right.

In Sweet Grass county an extensive irrigation project is being carried forward by the Securities Company, of Helena, which will reclaim forty thousand acres of the bench along the Yellowstone River and ten thousand acres will be watered from the Big Timber creek, in the vicinity of the city of that name. Under the contract with the State these lands can only be sold to actual settlers in tracts not exceeding 160 acres, and it is expected that the tract will be reclaimed and thrown open to settlement some time during the year 1907.

Nowhere can be found greater attractions and better opportunities for those seeking homes than in this State. These reclaimed lands can be secured under the homestead laws or by purchase from the irrigation companies at unusually reasonable prices and terms, and will prove the most productive of any to be found in this country. Coupling these advantages with our delightful and healthful climate and home markets for everything that can be produced, and there is no spot in the United States that can compare with Montana.

RESTORED TO PUBLIC DOMAIN.

On October 18, 1905, the Secretary of the Interior withdrew from settlement a tract of land in connection with the Lake Basin irrigation project, Montana, and has today restored to the public domain that part of it lying in the E. $\frac{1}{2}$ N. E. $\frac{1}{4}$, and E. $\frac{1}{2}$ S. E. $\frac{1}{2}$ Sec. 16, T. 2 N., R. 20 E., M. P. M., and reserved it for use by the Forest Service as a planting area.

Operations under the Okanogan project, Washington, having reached a point where the engineers have been able to determine that the following lands are not required, the Secretary of the Interior has restored them to settlement.

WILLAMETTE MERIDIAN.

T. 32 N., R. 25 E., all Secs. 1, 2, 3 and 10.
T. 33 N., R. 25 E., all Secs. 1, 12, 13, 24, 25, 26, 35 and 36.
T. 34 N., R. 25 E., lots 1 and 2, S. E. $\frac{1}{4}$ N. E. $\frac{1}{4}$, E. $\frac{1}{2}$ S. E. $\frac{1}{4}$ Sec. 1; E. $\frac{1}{2}$ Secs. 12 and 13; N. E. $\frac{1}{4}$ Sec. 24.
T. 35 N., R. 25 E., N. W. $\frac{1}{4}$, N. $\frac{1}{2}$ S. W. $\frac{1}{4}$, S. W. $\frac{1}{4}$ S. W. $\frac{1}{4}$ Sec. 2; E. $\frac{1}{2}$ S. E. $\frac{1}{4}$ Sec. 3; N. E. $\frac{1}{4}$ N. E. $\frac{1}{4}$, S. $\frac{1}{2}$ N. E. $\frac{1}{4}$, N. $\frac{1}{2}$ S. E. $\frac{1}{4}$ and S. E. $\frac{1}{4}$ S. E. $\frac{1}{4}$ Sec. 10; N. W. $\frac{1}{2}$ N. W. $\frac{1}{4}$, S. W. $\frac{1}{4}$, S. W. $\frac{1}{4}$ S. E. $\frac{1}{4}$ Sec. 11; E. $\frac{1}{2}$, N. E. $\frac{1}{4}$ N. W. $\frac{1}{4}$, E. $\frac{1}{2}$ S. W. $\frac{1}{2}$ Sec. 14; E. $\frac{1}{2}$ N. W. $\frac{1}{4}$, S. W. $\frac{1}{4}$, N. $\frac{1}{2}$ N. E. $\frac{1}{4}$, S. W. $\frac{1}{4}$ N. E. $\frac{1}{4}$, S. $\frac{1}{2}$ S. E. $\frac{1}{4}$ Sec. 23; S. W. $\frac{1}{4}$ S. W. $\frac{1}{4}$ Sec. 24; N. E. $\frac{1}{4}$, E. $\frac{1}{2}$ N. W. $\frac{1}{4}$ Sec. 26; S. $\frac{1}{2}$ S. E. $\frac{1}{4}$ Sec. 36.
T. 36 N., R. 25 E., S. W. $\frac{1}{4}$ S. W. $\frac{1}{4}$ Sec. 15; S. W. $\frac{1}{4}$ W. $\frac{1}{2}$ S. E. $\frac{1}{4}$, S. E. $\frac{1}{4}$ S. E. $\frac{1}{4}$ Sec. 16; N. $\frac{1}{2}$ N. E. $\frac{1}{4}$, N. $\frac{1}{2}$ N. W. $\frac{1}{4}$, Sec. 21; N. $\frac{1}{2}$ N. W. $\frac{1}{4}$, S. W. $\frac{1}{4}$ N. W. $\frac{1}{4}$ Sec. 22; W. $\frac{1}{2}$ S. W. $\frac{1}{4}$, S. W. $\frac{1}{4}$ N. W. $\frac{1}{4}$ Sec. 26; S. E. $\frac{1}{4}$ N. E. $\frac{1}{4}$ Sec. 27; W. $\frac{1}{2}$ Sec. 35.
T. 33 N., R. 26 E., N. $\frac{1}{2}$ N. W. $\frac{1}{4}$ Sec. 2; S. W. $\frac{1}{4}$ Sec. 5; all Secs. 6 and 7; W. $\frac{1}{2}$ Sec. 8; N. W. $\frac{1}{4}$ Sec. 10; N. W. $\frac{1}{4}$ Sec. 16; all Secs. 17, 18 and 19; N. W. $\frac{1}{4}$ Sec. 20; all Sec. 30; N. $\frac{1}{2}$ and S. W. $\frac{1}{4}$ Sec. 31.
T. 34 N., R. 26 E., all Secs. 2 to 9 incl., 16 to 20 incl., W. $\frac{1}{2}$ Sec. 29; all Sec. 30; E. $\frac{1}{2}$ Sec. 35; all Sec. 36.
T. 35 N., R. 26 E., all Secs. 24, 25, 35 and 36.

These lands will not be subject to entry, filing or selection under the public land laws until ninety days after notice by such publication as the Department may prescribe.

The secretary of the Interior has vacated his order of August 19, 1904, withdrawing certain lands in New Mexico in connection with the La Plata irrigation project, is so far as it affects the following described lands, and has restored the tract to entry:

W. $\frac{1}{2}$ N. W. $\frac{1}{4}$, N. E. $\frac{1}{4}$ N. W. $\frac{1}{4}$, and N. W. $\frac{1}{4}$ S. W. $\frac{1}{4}$, Sec. 4; S. E. $\frac{1}{4}$ N. E. $\frac{1}{4}$ Sec. 5, T. 29 N., R. 13 W.; also E. $\frac{1}{2}$ S. W. $\frac{1}{4}$ and N. W. $\frac{1}{4}$ S. E. $\frac{1}{4}$ Sec. 33, T. 30 N., R. 13 W.

These lands are desired for homestead entry and investigations show that their restoration will not affect the La Plata project. They will not become subject to entry, filing or selection under the public land laws until ninety days after the publication of such notice as the Department may prescribe.

BOSTROM'S IMPROVED FARM LEVELS AND BUILDERS' LEVELS.

This instrument is of simple and compact construction, possessing advantages which render them of special value to farmers, builders and railroad contractors for laying out irrigation ditches and laterals, constructing coffer dams and head works for main ditches, ascertaining the heights of springs and waterfalls and

connected with the plate supporting the turret by a spring detained screw *c*, giving it in effect a ball and socket joint. Only three leveling screws are used, which simplifies the manipulating, allowing the telescope to be adjusted with the least loss of time. The leveling of the plate to a perfectly horizontal position is done in two adjustments. The first is made with the spirit level parallel with two of the leveling screws, these being turned in opposite directions until the

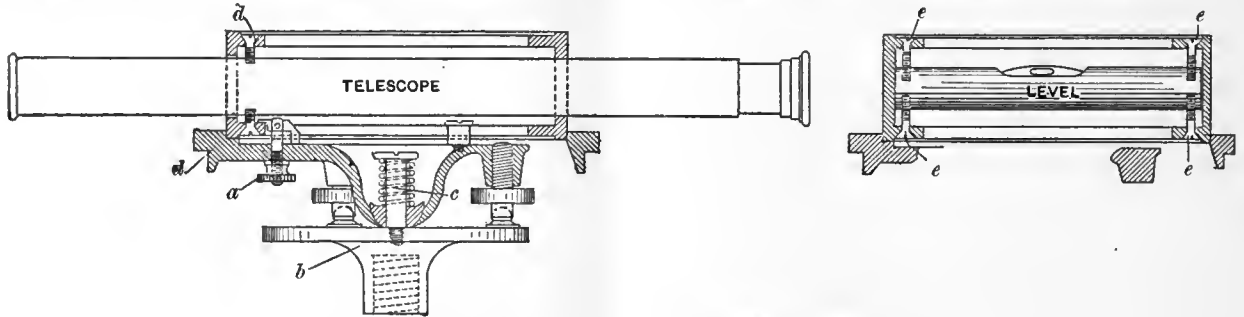


Fig. 2.—Cross Sections of Plane of the Telescope and the Spirit Level.

for leveling foundations, floor timbers and sills, leveling lines of shafting, setting machinery, etc. There has long been felt the want of both a farm level and a builder's level that should be practicable, accurate and low priced, to take the place of the expensive and complicated engineering instruments ordinarily used for the purposes named above.

The instrument as shown in Fig. 1 stands at about the height of the ordinary surveying level and weighs considerably less. It is easy of adjustment and is designed for quick and accurate work, there being no long and short back and front sights necessary in testing its accuracy. The farm level is constructed of iron and the builder's level entirely of brass, both have a graduated scale divided into 360 degrees, numbered from zero to 90 degrees in both directions, giving zero points on opposite sides of the circle. By a vertical line on the side of the turret, angles may be read within a fraction of a degree. The angle being adjusted, it is clamped in position by a single clamping screw, shown in Fig. 2, which represents a cross section of the instrument in the plane of the telescope and spirit level. A ground spirit level vial, shown at the right in Fig. 2, is provided, which makes the instrument sensitive and accurate. The telescope is acromatic and is designed and made especially for this instrument. It gives a clear field, and the magnifying power of the eye piece is as great as can be used to advantage on an instrument of this kind. The cross hairs are set in the eye piece and are secure against displacement except through extreme carelessness. A neat leveling rod is furnished with the instrument, which is of light construction and telescopes to 5 feet when closed, its extended length being 9½ feet. It has a sliding target and is graduated to feet, inches and fourths of an inch. When desired, a compass is added to the builder's level, whereby it can be used in retracing land lines or for determining the bearing and direction of lines in preliminary surveys, etc. The farm level is constructed on the same lines as the builder's level, the body being made of iron instead of brass and the clamping device for the circle of degrees omitted. The construction of these levels is unique and interesting and will be understood by reference to Fig. 2. The adjusting head *b* screws directly to the top of the tripod and is flexibly

bubble is at the center. The turret is then turned at right angles to its first position and the third screw turned until the level is again horizontal. The upper and lower faces of the turret proper are parallel, so that it is reversible. The telescope passes through diametrically opposite holes in the turret and may be adjusted by means of the screws *d*, to make certain its accurate position. The testing consists of sighting on an object through the telescope when it rests in its normal posi-

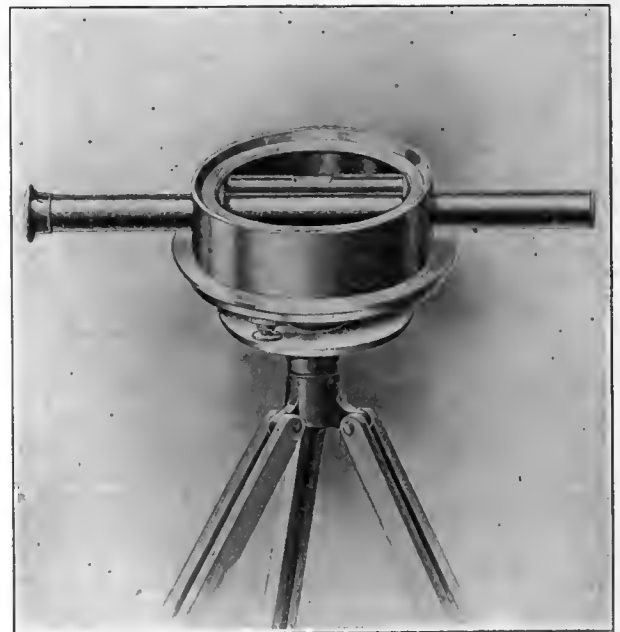


Fig. 1.—Bostrom's Improved Builders' Level.
General View of Instrument ready for use.

tion, as shown, and in sighting on the same object after reversing the turret so that its former upper face becomes the face resting on the turret support. The adjusting screws *c* are provided for correcting the level if it is found to be out of adjustment. It may be easily tested by leveling it and turning it end for end, when the bubble should still be in the center. There is seldom an occasion to correct these adjustments unless the instrument has suffered some damage from a mis-

hap, as the levels are accurately tested before they leave the factory, but it is advisable to always apply the tests before using. The device on the builder's level for clamping the turret by means of only one screw is novel. Attached to the upper end of the screw is a short lip or dog, which bears on the flange on the turret. This dog is connected by small wires with two similar dogs equilaterally disposed. When it is desired to remove the turret, the clamping screw is loosened and pushed toward the center of the instrument. This action releases all three dogs simultaneously, leaving the turret free to be lifted from its seat. The tripod is of special design, which contributes to its lightness. Instead of the ordinary solid legs, the legs are split longitudinally, the split parts being separated by blocks, so that a very rigid construction is obtained. These instruments are being largely used in agriculture and building and have

RECLAMATION SERVICE NOTES.

The President has issued an order reserving the northeast quarter of section 24, town 9 north, range 5 east, Black Hills meridian, South Dakota, within the limits of the Belle Fourche irrigation project, for the purpose of experimental work in agriculture, under the supervision of the Department of Agriculture, the tract, however, to remain under the general jurisdiction and control of the Reclamation Service.

A conference has been called to be held at Portland, Ore., or Seattle, Wash., early in July between the engineers of the Reclamation Service and Chief Engineer Code of the Indian Irrigation Service, and Mr. J. Lynch, superintendent of the Yakima Indian Agency, to consider matters with reference to the reclamation of the lands in the Yakima Indian Reservation in connection with the Yakima project.

A contract has been executed with the D'Olier Engineering Company, of Philadelphia, Pa., for furnishing and installing an electric power plant in connection with the Garden City irrigation project, Kansas. The contract calls for the installation, ready for operation, of an electric power



The Rural Road Grader and Ditcher at work.

commanded testimonials of the highest character from parties using them in all sections of the country, and we predict that when their merits are better known, no farmer or contractor will consider his outfit complete without one. Write to the Bostrom-Brady Manufacturing Company, Atlanta, Ga., a perfectly reliable concern, for descriptive circulars and such other information as may be desired and your inquiries will receive prompt and courteous attention.

THE C. D. EDWARDS MACHINERY.

We are presenting in this issue an advertisement of the Edwards' ditching machine, road grader and stump pullers and show also in our reading pages illustration of a road grader at work. These machines have been manufactured by Mr. Edwards for many years and have given excellent satisfaction, as will be noted by the testimonial shown in the advertisement. For additional information and copies of testimonials from numerous people who are now operating them successfully, write C. D. Edwards, Albert Lea, Minnesota.

plant of 450-kilowatt switchboard output, for pumping purposes, including boilers, engines, generators, switchboards, and whatever may be necessary to make a complete plant, using for prime movers two De Laval steam turbines. The bid of the contractors was \$46,300.

Mr. J. B. Lippincott, consulting and supervising engineer in charge of work in California, has resigned his position with the United States Reclamation Service. Mr. Lippincott, who is a graduate of Dickinson College, Pa., and the University of Kansas, has been engaged in civil engineering since 1886. For several years he was prominently connected with irrigation work in California in private capacity, and since 1895 has had charge of the hydrographic investigations for the United States Geological Survey in that State. He is one of the oldest engineers in point of service in the reclamation bureau, and the resignation of so able and energetic an assistant is greatly regretted by the officials of the department. There is an increasing demand throughout the country for the services of first-class engineers, and owing to the limited salaries offered by the Reclamation Service the Government is losing many men of experience and ability.

Authority has been granted to the Reclamation Service to prosecute the work incident to the construction of nineteen miles of canal and twenty-seven miles of laterals, with appurtenances, in connection with the Klamath project, California-Oregon, by force account, and to employ the force required to carry the work vigorously to completion in order

that this distributing system may be ready for use when the main canal, now under construction, is completed. The board of consulting engineers recently convened at Klamath Falls to open bids for this work reported that no bids were received. The time required to readvertise this work, it is believed, would so delay construction that it is improbable water could be provided for irrigation by next season.

An extension of time of twenty days from May 1, 1906, has been given to Robinson & Maney, contractors, for the completion of Divisions 1, 2, 6, 7, 9 and 10, Interstate Canal, North Platte project, Nebraska. The work of the contractors was greatly delayed by inclement weather and floods, but the failure to complete the contract on time did not interfere with the delivery of water through the canal at the time agreed upon, and therefore caused no loss to the Government.

AN IMPORTANT OPINION ON PRACTICAL QUESTIONS.

The Assistant Attorney General has just rendered an important opinion on the following questions:

First—Whether one who has made a homestead entry, not exceeding the farm unit limit, either under the provisions of the Reclamation Act or under the general law, may obtain water for such tract and also for one or more other tracts of which he is the proprietor, provided the area held in private ownership does not exceed the private ownership limit fixed by the Secretary of the Interior.

Second—If the homestead entry was made prior to the Reclamation Act withdrawal and contains an irrigable area in excess of the farm unit limit whether, for the purposes under consideration, the excess area is to be regarded as of the same status as land in private ownership.

The case in point is on the Minidoka project, Idaho, where certain State lands fall within the irrigable area. The lands under this project have been classified and the farm unit fixed at 80 acres. The question arose as to whether a person who makes a homestead entry of 80 acres under the Minidoka project and also purchases 80 acres of State land may secure water from the Government works for the irrigation of both tracts. The point submitted involves a broad question applicable to all of the reclamation projects. The Assistant Attorney General holds that:

"A person who has made or may make homestead entry of lands withdrawn for disposal under the act of June 17, 1902 (32 stat. 288) and subject to the provisions, limitations and conditions of said act, may obtain water for such tract and may also obtain water for one or more tracts of which he is the proprietor, not exceeding the limit of area fixed by the statute, authorizing the use of water for land in private ownership, or as fixed by the Secretary of the Interior.

"If the entry was made prior to the withdrawal under the Reclamation Act, the entryman may be entitled to the right to the use of water for the irrigable area of the land entered, and also for such area of lands held by him in private ownership which added to the irrigable area of his entry will not exceed 180 acres.

"While there appears to be no restriction in the act upon the right of a homesteader to the use of water for land owned by him to the extent of area allowed to any one landowner, it has been deemed advisable to administer the law through the instrumentality of water users' associations which are organized by the owners of lands within the project. By the contracts heretofore made with such associations by the Secretary of the Interior, only those who are or may become members of such associations will be accepted as entrymen or applicants for the right to the use of water which may be impounded or controlled by the works of such project.

"Under the articles of incorporation and by the laws of such associations, which are part of every contract, every member or shareholder of the association, whether he be the owner of lands or an entryman of public lands, is restricted in his holding to 160 shares of stock, one share being allowed to each acre or fraction thereof. So that, the Secretary of the Interior, by entering into a contract with such associations, has fixed 160 acres as the limit of the right to the use of water by any one person, whether the land irrigated is entered as public land or is held in private ownership, or under both rights."

The officials at Washington have adjusted the allotments of the reclamation fund in accordance with recent estimates from the general land office as to the probable amount of this fund during the next two years. The fundamental principle has been to allot the funds to the projects where the work is now furthest advanced and where returns to the fund may be expected in the near future. The surveys and examinations already made show that at least \$100,000,000 could be used to advantage in various parts of the arid West. The total fund which will be available from the proceeds of public lands for the years 1901-8 is estimated by the general land office to be a little over \$41,000,000. In order, therefore, to continue the work, it is necessary that this money, or as much of it as possible, be invested in works which will begin to yield returns to the fund at the earliest possible date, so that the money may be used over again as soon as possible for the construction of other works. In several of the projects a number of years must elapse before the works will be completed. Such projects will not be revenue producing for some years. On the other hand, in Nevada the work has advanced to a point where upward of 50,000 acres are already under irrigation and revenue may be expected soon from this area. Other projects are nearing completion and every possible effort is being made to finish these so that they may begin to repay the cost. The allotments as recently approved by the Secretary of the Interior now stand as follows:

State.	Project.	Amount.
1. Oregon—		
	Klamath*	\$2,000,000
	Klamath (future).....	2,400,000
	Umatilla	1,000,000
		<hr/>
		\$5,400,000
2. Arizona—		
	Salt River.....	4,539,161
3. Montana—		
	Huntley	900,000
	L. Yellowstone	2,000,000
	Milk River	1,000,000
	Sun River	500,000
		<hr/>
		4,400,000
4. Nevada—		
	Truckee-Carson	3,700,000
5. Nebraska-Wyoming—		
	North Platte	3,330,000
6. Idaho—		
	Minidoka	1,550,000
	Payette-Boise	1,490,000
		<hr/>
		3,040,000
7. California-Arizona—		
	Yuma	3,000,000
8. Washington—		
	Okanogan	500,000
	Tieton	1,250,000
	Sunnyside	1,100,000
	Indian Res.	100,000
		<hr/>
		2,950,000
9. Colorado—		
	Uncompahgre	2,500,000
10. Wyoming—		
	Shoshone	2,250,000
11. South Dakota—		
	Belle Fourche	2,100,000
12. North Dakota—		
	Pumping projects	1,000,000
	L. Yellowstone	700,000
		<hr/>
		1,700,000
13. Utah—		
	Strawberry Valley	1,250,000
14. New Mexico—		
	Hondo	336,000
	Carlsbad	600,000
	Rio Grande	200,000
		<hr/>
		1,136,000
15. Kansas—		
	Garden City	260,000

*The total allotted to the Klamath project, Oregon, is \$4,400,000; of this \$2,000,000 is immediately available and \$2,400,000 to be set aside for future funds.

The Reclamation Service engineers are justly proud of the progress being made on the Gunnison tunnel in Colorado,

which is being constructed by force account. The first mile, or one-sixth of the tunnel was completed on November 17, 1906. The first of the present month 13,767 feet had been excavated, 1,321 feet having been completed during the month of June. Night and day unceasingly the drills are breaking their way through the granite wall and the world's record in tunnel excavation has been established on the work.

The Secretary of the Interior has restored to settlement the SW $\frac{1}{4}$ SW $\frac{1}{4}$, E $\frac{1}{2}$ SW $\frac{1}{4}$ and SW $\frac{1}{4}$ SE $\frac{1}{4}$, Sec. 25, T. 34 N., R. 77 W., Wyoming. This land was withdrawn in 1903 in connection with the North Platte irrigation project. It now appears that the land is valuable for its minerals, and as this action will not interfere with the irrigation project it has been restored to settlement. The tract will not be subject to entry, filing, or settlement, however, until ninety days after notice by such publication as may be prescribed by the department.

A contract has been awarded to Hughes & Olson, of Butte, Mont., for the construction of Division 3, main canal, and high line canal, Huntley irrigation project, Montana. This work, which consists of about ten miles of main canal and seven miles of high line canal, involves the excavation of about 350,000 cubic yards of material. The bid of the successful contractors was \$77,610.

On the fourth anniversary of the formation of the Reclamation Service from the Hydrographic Branch of the Geological Survey, it has definitely broken away from the parent body and moved into new quarters. During the four years of its existence the organization has increased from less than a dozen men to over four hundred engineers and assistants, carrying on work throughout widely scattered localities in the arid West. Contracts have been let and work is under way involving the expenditure of upward of \$25,000,000 and other contracts are being prepared which will necessitate the expenditure in all of nearly \$40,000,000. There are now working for the contractors about 10,000 men, and the Reclamation Service has working directly for it over 2,000 men, including day laborers and mechanics. The monthly expenditures aggregate about \$1,000,000, having gradually increased until they are now practically at the maximum. It is not probable that there will be further expansion but, on the contrary, a considerable consolidation and reduction of force as the larger works are completed. The rapid growth of the Reclamation Service is indicated by the annual expenditures. For the fiscal year ending June 30, 1903, these were a little over half a million dollars; for 1904, one and one-half millions; for 1905, three and three-quarters millions, and for the year ending June 30, 1906, very nearly eight millions, the greater part of this amount being expended during the months of May and June, when the expenditures reached over a million dollars each.

The officials have temporarily withdrawn from any form of disposition whatever the following described lands in the State of Oregon, for use in connection with the Payette-Boise irrigation project: Willamette meridian, T. 23 S., A. 46 E., all secs. 15, SE $\frac{1}{4}$ sec. 16; E $\frac{1}{2}$ sec. 21; NW $\frac{1}{4}$ sec. 27; all secs. 28 and 33. T. 24, S., R. 46 E., N $\frac{1}{2}$, sec. 4; W $\frac{1}{2}$ sec. 5; all sec. 6; N $\frac{1}{2}$ sec. 7. These lands embrace three reservoir sites on Succor Creek.

The Secretary of the Interior has granted an extension of forty days from June 5, 1906, to the S. Morgan Smith Company, of York, Pa., in which to complete certain work upon their contract for furnishing water wheels for the power plant in connection with the Salt River project, Arizona. The request for extension of time was necessitated by reason of the failure of the mills to supply structural steel.

The board of consulting engineers of the United States Reclamation Service recently convened at Portland, Ore., to open bids for the construction of Schedules 1 and 2 of the storage feed canal, Umatilla project, Oregon, reports that four bids were received on Schedule 1 and six bids on Schedule 2. The bids of the Puget Sound Bridge & Dredging Company, of Seattle, Wash., \$112,796.50 on Schedule 1, and \$48,592 on Schedule 2 were the lowest received.

Bids for the construction of the Cold Springs dam, Umatilla irrigation project, Oregon, were recently opened at Portland. Two proposals were received, the lowest being that of Sweeney & Holmes, of Portland, Ore., for \$383,415.

Only one bid was received for the construction of storage works and main canal in connection with the Okanogan irrigation project, Washington. The contractor who submitted proposals was Matthew P. Zindorf, of Twisp, Wash., amounting to \$164,153.75 on Schedule 1 and \$85,750.50 on Schedule 2.

The officials are advertising for bids for pumping machinery for the Buford-Trenton irrigation project, North Dakota. The work calls for the installation of three transformers of 300 kilowatt capacity, and eight motor-driven pumping units of capacities of 16 and 30 cubic feet per second under heads of 50 and 33 feet respectively, with necessary electrical apparatus and water pipes, in pumping stations near Buford, N. D. The proposals will be opened on September 10th, at Williston, N. D., and detailed information may be obtained from the chief engineer, United States Reclamation Service, Washington, or H. A. Storrs, electrical engineer, Williston, N. D.

The board of consulting engineers of the United States Reclamation Service, recently convened at Chicago, Ill., to open bids for pumping apparatus for the Garden City project, Kansas, reports that eleven proposals were received. The lowest formal bid was that of Henion & Hubbell, Chicago, \$13,750 for ten 5 second-foot centrifugal pumps with bronze impellers, each combined with a twenty-five horsepower motor and vacuum pump.

An investigation was recently made by the cement experts of the United States Reclamation Service to determine the existence and availability of raw materials for the manufacture of Portland cement in the vicinity of Havre, Mont. An area exceeding 355 acres convenient to Assiniboine station, on the main line of the Montana Central Railway, Great Northern system, was found to contain an unfailing supply of natural cement rock. Suitable clay for an admixture, if needed at any time in the preparation of cement, is abundant on the ground, and the bituminous coal mines throughout the section furnish fuel adapted for the burning of the rock. A mill site and town site were located and large springs furnish an abundant water supply for domestic and other purposes. The Reclamation Service has four large projects in Montana which have been approved by the Secretary of the Interior. Upon two of these work is well under way. The estimated cost of these four great works is \$12,600,000, and upon their completion depends the reclamation of approximately half a million acres of land. Thousands of barrels of cement will be needed in their construction, and the service is naturally gravely concerned in the output of this material, as the present unprecedented demand for cement all over the West is already taxing the capacity of mills throughout the country to the utmost. It is believed that investors will embrace the opportunity presented by the known existence of materials suitable for cement manufacture in various localities in the West. The great profits arising from the successful conduct of the cement business is now too well known to require comment. It is not the policy of the Government to go into the cement business unless through the inaccessibility of the works the success of a project should become jeopardized, as in the case of the Salt River project, Arizona, where the great distance from existing mills and the long wagon haul made the cost of cement prohibitive.

The department is advertising for bids for the construction of canals and structures in connection with the Buford-Trenton project, North Dakota. The work involves the excavation of about 410,000 cubic yards of earth, and furnishing labor and material for a pumping station and various structures requiring about 140,000 feet B. M. of lumber, about 2,000 cubic yards of concrete and about 25,000 pounds of structural steel. Detailed information concerning the plans and specifications may be obtained from the chief engineer, United States Reclamation Service, Washington, D. C., or H. A. Storrs, electrical engineer, Williston, North Dakota. The bids will be opened at Williston on September 11th.

The officials have vacated the award of contract recently made to D. H. Freeman & Co., of St. Cloud, Minn., for the construction of Division 3, main canal, Lower Yellowstone irrigation project, North Dakota and Montana, and has awarded the contract to Newman & Hoy, of St. Paul, Minn. Division 3 consists of nine miles of canal, involving 1,088,800 cubic yards of excavation, and furnishing such material and doing such work as may be necessary for the completion of the work.

The Secretary of the Interior has authorized the engineers of the Reclamation Service to survey and subdivide the lands in the Fort Shaw abandoned military reservation, Montana. These lands are needed in connection with the Sun River irrigation project, which is designed to reclaim about 250,000 acres in the valley of Sun River. A large percentage of this land is public domain and lies in a broad prairie extending from Teton River on the north to Sun River on the south, a distance of thirty miles, and from the Rocky Mountains on the west to Missouri River on the east, a distance of seventy miles. The sum of \$500,000 has been allotted from the reclamation fund for initiating this great work.

The board of consulting engineers of the United States Reclamation Service which recently convened at Billings, Mont., to open proposals for the construction of the Corbett dam, Shoshone project, report that five proposals were received. The lowest bid was that of the Billings Construction Company, Billings, Mont., \$66,750. The Corbett diversion dam is to be a low structure across the Shoshone River about sixteen miles below Shoshone dam, and will be used to divert the water into a tunnel through which it will be carried to the Garland canal to irrigate about 80,000 acres of land on the north side of the river.

The board of consulting engineers of the United States Reclamation Service, which recently met at Garden City, Kas., to open bids for the construction of a combined office and residence building for use in connection with the Garden City irrigation project, reports that only two bids were received, that of John D. Wells at \$5,390 and P. S. Osgood, \$4,000. Both contractors are residents of Garden City.

Oregon leads in the Government work of reclamation, both in the amount of money contributed to the reclamation fund through the disposal of public lands in that State, and through the amount of money set aside for the construction of works within its borders. It also leads in the difficulties encountered in getting the work started. Although the natural advantages of the State are great and appear attractive on first sight, yet it has required more time and energy to find feasible reclamation projects than elsewhere. This is due to a number of conditions, such as legal complications, the lack of transportation facilities, and the ownership of land in large bodies by cattle companies and syndicates who have acquired vast tracts under the federal land laws. Immediately after the passage of the reclamation act on June 17, 1902, investigations were begun throughout the State. Public meetings were held by interested citizens and a large number of schemes suggested. One after another these were found to be impracticable from lack of dependable water supply, or were tied up in complications of vested rights to water, or entangled with large land grants. Disappointment followed most of the attempts, but finally out of the large number of projects examined the Secretary of the Interior was able to declare feasible the Klamath project in the southern part of the State on the border of California and the Umatilla project in the northeastern part of the State. For the Klamath project the Secretary of the Interior set aside the sum of \$4,400,000, of which \$2,000,000 are now available and are being used, the remainder, \$2,400,000, to be used in the future. For the Umatilla project \$1,000,000 have been set aside and contracts are being let for the expenditure of that sum. This is the first unit of the proposed John Day project taking water from the river of that name and carrying it across the Blue Mountains to the fertile slopes south of Columbia River. This great project will cost upwards of \$10,000,000 and will require many years for completion. The first part, however, near Umatilla River, can be carried out within a relatively short time.

MADISON RIVER PROJECT, MONTANA.

An investigation of the Madison River irrigation project, Montana, was recently completed by the engineers of the United States Reclamation Service, and a report made to the Secretary of the Interior. Numerous surveys have been made by various corporations and individuals since 1887 for the purpose of locating a feasible irrigation system in this vicinity, but no practicable project was found. Owing to the fact that approximately 150,000 acres of land very advantageously situated with respect to market, and with exceptionally good railroad facilities, located near Helena are believed to be reclaimable from Madison River, a careful reconnaissance was made by the Reclamation Service in 1905.

The main unit of the project outlined by the engineers consists of about 43,000 acres of land in and adjacent to Prickly Pear Valley near Helena; a second tract of about 53,000 acres lies in Crow Creek Valley on the west side of the Missouri River near Radersburg, and smaller tracts aggregating about 52,000 acres bring the total reclaimable area up to approximately 148,000 acres.

The plan in brief is to construct a storage dam in Madison River Canyon, the stored water to be discharged into Madison River as required, and at a point about seven miles below the dam, near the mouth of Cottonwood Gulch, diverted by means of a weir into a canal on the west bank of the river. This canal will run in a northerly direction along the left bank of Madison River for about thirty miles, crossing the Jefferson River by a siphon over three miles long in the vicinity of Willow Creek, and thence parallel but at some distance from the west bank of Missouri River to a point on McClellan Creek, into which its waters discharge. For about two and a half miles the channels of McClellan and Prickly Pear creeks will be used, the waters being diverted from Prickly Pear Creek near East Helena, the canal then encircling Prickly Pear Valley, discharging into a coulee at its lower end.

The entire length of the canal would be 150 miles, including 16 miles of tunnels, 27¾ miles of concrete lined sections, 4 miles of siphon pressure pipe, 99½ miles of earth canal and 2½ miles of natural stream channel. There is one drop of 70 feet, and a drop of 260 feet in the stream channel.

A small independent part of the project contemplates the irrigation of about 16,000 acres on the east bank of Missouri River in the vicinity of Toston and Townsend, by a canal diverting water from the Missouri River on its right bank about three and one-half miles above Toston and running in a general northerly direction for about thirty miles.

The unregulated discharge of the Madison River at the proposed point of diversion would, in some years, be sufficient to supply the canal throughout the irrigating season, but in other years there would be a shortage in July, August and September. On account of this shortage and for the further reason that the entire low water flow of Madison River is being used for power development at points lower down on the Missouri River, it will be necessary to regulate by storage practically the entire discharge of Madison River, and this would be provided for by the dam in Madison River Canyon, which would create a reservoir with a capacity of 600,000 acre-feet.

The total estimated cost of the project is \$14,413,000. On a basis of 147,800 acres this gives a cost per acre of \$97.50. Allowing \$5 per acre for ten years maintenance and operation brings the cost up to about \$102.50 per acre. The long canal line with its expensive river crossings, tunnels and other structures necessitated by the topography of the country, are responsible for the high cost of construction.

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There is some rejoicing and much sorrowing among the farmers under the first forty-five miles of the Interstate canal, North Platte project. The cause of this paradoxical situation is that the month of June saw the completion of this section of the great ditch, the successful passage of water to the end of the constructed canal and its delivery for irrigation purposes, and that like the foolish virgins a large number of settlers were not ready for it. On June 17th the water in the canal had reached a point at about the forty-first mile and on June 18th it had reached the end of the forty-fifth mile. The Whalen Falls Canal Company is drawing at all their headgates a maximum of about five cubic feet per second, with an average of probably not to exceed three cubic feet per second. There has been coming into the headgate a maximum of about 130 and a minimum of about 30 cubic feet per second. Some 1,200 acres of land are in crop and have been irrigated from the canal; the balance of the 20,000 acres is not prepared to receive it. The lateral systems under the Whalen Falls canal, and through which water is to be taken from the Government canal, are not built, with the exception of one at the twenty-fifth mile, which was opened about the middle of June.

The Secretary of the Interior has appointed Mr. Caleb Jones, of St. Anthony, Idaho, to serve on the board of appraisers of town lots under the Minidoka project, which now consists of Mr. Jones, Mr. J. H. Lowell, Caldwell, Idaho, and Mr. Gerard N. Matthes, of the United States Reclamation Service. This board has been directed to assemble at the townsite of Heyburn at the earliest possible date after having executed the oath of office, and at once proceed with the work of appraisal and continue same until completion. The lots to be appraised at Heyburn are those in the NW $\frac{1}{4}$ sec. 10, T. 10 S., R. 25 E., 3 M., and number 480. Upon the completion of the appraisal at Heyburn the board will proceed at once with the appraisal of the lots at Rupert, the lots to be appraised at this point numbering 371. The board will report the cash value of each lot as agreed upon, the character of land, whether grading is required, etc.; character and value of improvements, whether improvements are permanent or such as may be easily removed, and estimated cost of removing them. Where improvements are considered permanent the total valuation of the lot will include the value of improvements. It is expected that the report of the board of appraisers will be received by the Secretary of the Interior very soon, and the date of sale will probably be definitely settled at that time.

There is good news from Gunnison tunnel, Colorado, to the effect that the headings 3 and 4 have finally been brought together, and the most disagreeable part of the work is now over. This is the portion under the broad valley of Cedar Creek, where the tunnel has been for nearly a mile in river sands and gravels, clay and soft shale. Heading No. 4 was driven from the outlet in the valley and No. 3 from a shaft a mile away, under conditions such that it was very difficult to give directions so that the tunnels driven toward each other would exactly meet. The completion of this portion of the work leaves it possible to concentrate work on the headings Nos. 1 and 2, which are under the main portion of the mountain. In No. 1 the material is a hard, reddish quartz or coarse granite, changing to a mica schist. In this portion the progress has been upwards of twelve feet a day, while in the softer black shale in heading No. 2 the progress has been over twenty feet a day.

The latest news from southern California shows that the inflow of Colorado River to the Salton Sea has fallen off about one-half of the flood stage. There are now less than 40,000 cubic feet per second pouring through the new outlet of the Colorado River into Mexican territory and returning to the United States, inundating land in San Diego county, California. That is equivalent to an amount sufficient each day to cover 80,000 acres one foot in depth. The Salton Sea during July has risen a little less than one-half foot a day, and will continue to rise with diminished rapidity owing to the fact that the inflow has dropped off and the area of land to be covered is increasing with each foot of rise, the water spreading back for long distances over the nearly level desert. The Southern Pacific tracks and property are, however, threatened in such a way that the company is making elaborate preparations to stop the flow of the river in Mexico and return it to its former channel on the international boundary. Instead of resorting to temporary expedients as was done last year, the company, now realizing that conditions are far more serious, have gone to work systematically and have

built a spur railroad leading from the main line of the Southern Pacific near Yuma and extending south to and across the international boundary to the point where the Colorado broke over its banks. By the use of this railway it will be possible to transport men and material to the place and to procure rock in great quantities for use in reinforcing the structure to be built. There is every reason to believe that with the experience attained by past failures and with the realization of great dangers in the future, the company will pour in sufficient money and men to check the river and stop for all time the threatened overflow of the hundreds of farms and thousands of homes in the Imperial Valley.

The work on the Gunnison tunnel, which is being built by the United States Reclamation Service in Colorado, is being delayed by a curious condition. The tunnel, now more than a mile underground, has been driven with rapidity through a hard black shale. The heading has now advanced to a point where it is passing through a great accumulation of sea shells. Thousands upon thousands of them imbedded in the rock are being dug out, some of them of gigantic size—upwards of three feet or even more in diameter. The process of excavating the shells is easy, but for the fact that they render the ground exceedingly treacherous. A few of these large shells imbedded in the roof make a point of weakness, and without warning a mass of a hundred pounds or even of several tons of the black shale carrying the shells may be precipitated upon the workmen. It is therefore necessary to support the roof of the tunnel with timber for every foot of advance in order to protect the workmen from injury or death. It is curious that these shells deposited in the ocean millions of years ago are now being brought to light and are endangering the lives of creatures hundreds of centuries younger than they. Each of the shells at one time held a living organism whose bulk would be sufficient to make a meal for a dozen men.

The United States Reclamation Service has just passed its fourth birthday, and that it is a very vigorous infant is shown by a summary of the work accomplished during its brief existence. Work is now under way on twenty-two projects and 13,600 acres of land have been actually irrigated. Up to July 1st, 241 miles of main canal, 116 miles of distributing system, and 388 miles of ditches had been constructed, including dams, headworks, etc. Tunnels having a total length of more than five and a half miles have been driven, including over two and a half miles of the great Gunnison tunnel in Colorado. More than 521 Miles of telephone lines have been installed and are now in operation; 233 miles of wagon road, many miles of which were cut in solid rock in almost inaccessible canyons, 110 bridges, and 300 office and other buildings have been constructed. The works above mentioned have called for the excavation of 17,403,213 cubic yards of earth and rock, the laying of 134,446 cubic yards of concrete, 124,901 square yards of rip rap and paving; 42,947 linear feet of piling have been driven. There have been purchased 1,873 tons of iron and steel, 7,347,312 feet B. M. of lumber, and 159,623 barrels of cement. The Government cement mill at Roosevelt, Ariz., erected at a cost of more than \$100,000, has turned out 43,000 barrels of cement, and Uncle Sam's saw mills have cut 2,889,000 feet B. M. of lumber from the Government reserves.

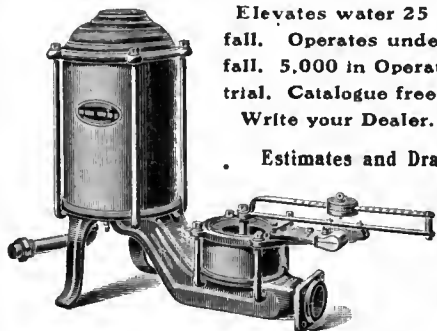
All bids for the construction of 135 miles of laterals for the irrigation of lands under the Interstate canal, North Platte project, which were recently opened at Mitchell, Neb., have been rejected. The bids were rejected on the ground that they were greatly in excess of the estimates, and new proposals will be asked for unless the bidders promptly submit lower bids.

The Secretary of the Interior has restored to public domain the following described lands in the State of South Dakota, which were reserved in connection with the Belle Fourche irrigation project, and has withdrawn the tracts from public entry for townsite purposes in connection with this project: Black Hills meridian, T. 8 N., R. 7. E., NE $\frac{1}{4}$ sec. 7; T. 9 N., R. 4 E., NE $\frac{1}{4}$ sec. 14.

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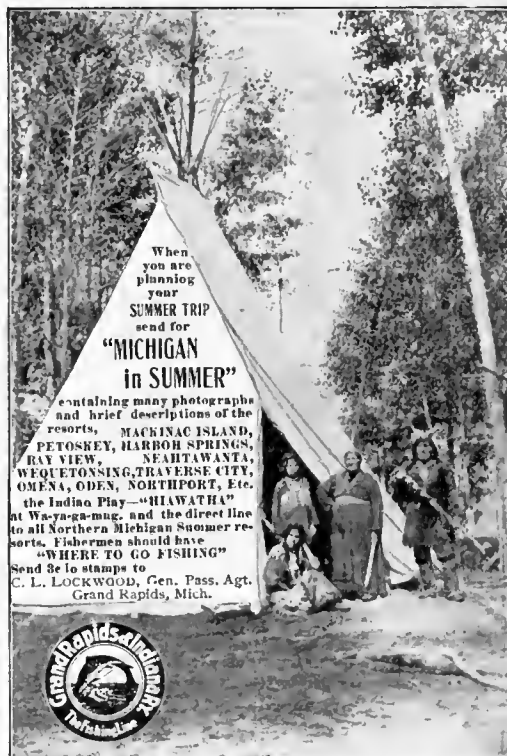
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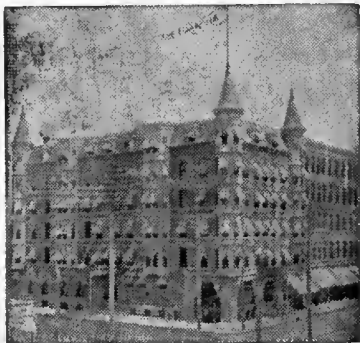
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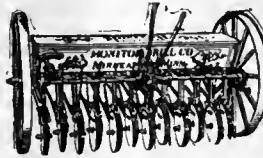
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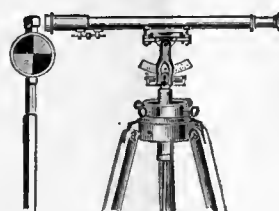
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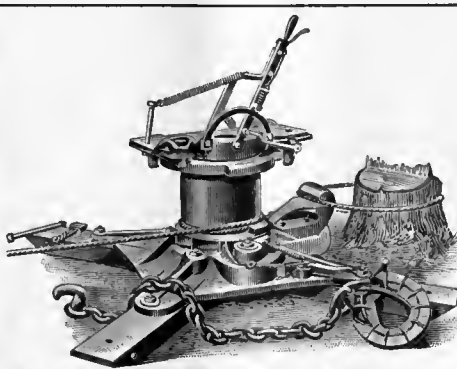
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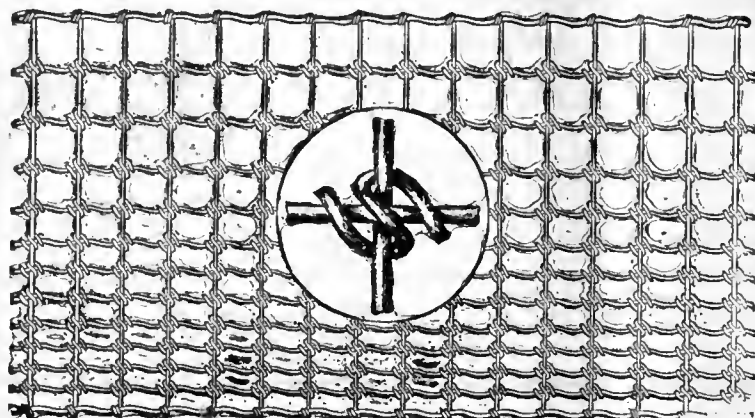
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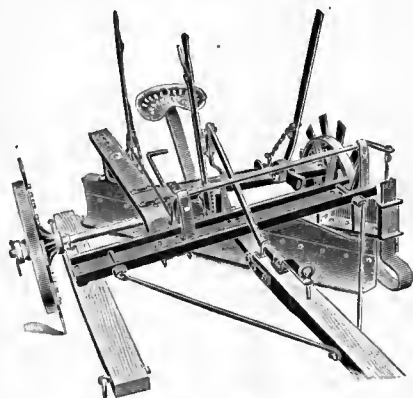
are progressive, enterprising and ready to spend time and money in the development and improvement of your land; possibly are raising stock, engaged in diversified farming or growing young orchards. In line with this improvement, it will be necessary for you to consider fencing; the day has passed when a couple of strings of barb wire can be called fence; this is an age of better things and you can now buy the best quality of hard steel, springy, galvanized, woven wire fencing, ready to staple on your posts for slightly more than the cost of the raw material.

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Operated by One Man and Two Teams. Sold on Trial.

TESTIMONIAL.

SPENCER, IOWA, May 19, 1906.

C. D. Edwards, Albert Lea, Minn.

Dear Sir:—You will please find enclosed draft for \$65.00 in payment for one Rural Road Grader and Ditcher, ordered of you April 28, 1906. Would much rather have it than an eight-horse grader. Can do more and better work with it at one-half the expense and can work it where we cannot the larger one, so you can rest assured we are well satisfied with the machine.

Yours respectfully, J. R. FLOYD, R. F. D. No. 1.

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I manufacture the Climax and Chief Pullers also, intended for lighter work.

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Send for catalog of the machine you are interested in.

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THE
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along the lines of the Illinois Central and Yazoo & Mississippi Valley railroads, in the States of Kentucky, Tennessee, Mississippi and Louisiana, including the famous :: :: ::

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Thousands of Acres of Fertile Lands

capable of raising the finest quality of farm products in luxurious abundance, are for sale upon reasonable terms in Wisconsin, Northern Michigan, Minnesota, South Dakota, Iowa, Nebraska and Wyoming. Reference to reliable statistics will demonstrate the fact that the pursuits of

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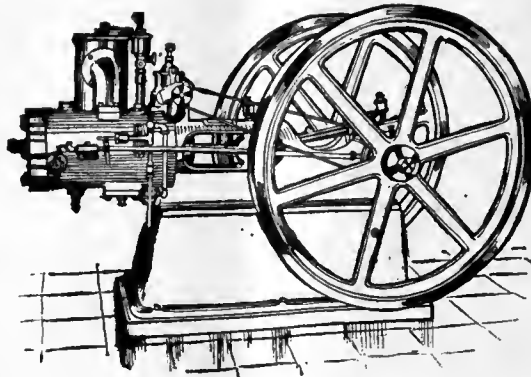
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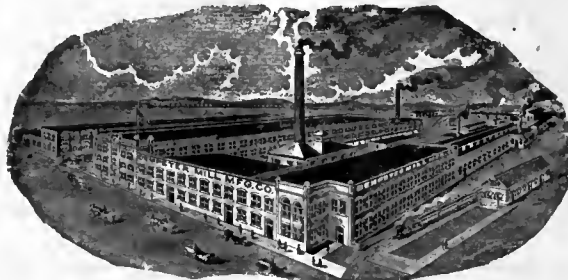
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THE IRRIGATION AGE

PUBLISHED IN THE INTEREST OF IRRIGATION FARMERS,
DEALERS IN AND MANUFACTURERS OF IRRIGATION AND
GENERAL FARM MACHINERY.

VOL. XXI.

CHICAGO, SEPTEMBER, 1906

No. 11.



THE NEW WAY

which is

Revolutionizing the Re-claiming of Arid Lands ::

Irrigation ditches are now made in an entirely NEW and SCIENTIFIC way, having for the FUNDAMENTAL IDEA the making of a PERFECT PERMANENT WATER-WAY, and not the mere digging of a ditch with no thought of NATURE'S laws. The worthless desert may now be transformed, at small cost, into a GARDEN SPOT with the

AUSTIN DRAINAGE EXCAVATOR

It constructs a ditch at a single operation, perfectly true to grade, of practically any depth, width of bottom or width of top, and slopes the banks to any angle.

The waste banks are built at a distance from the ditch, may be made continuous to serve as dykes and increase the capacity of the ditch.

It cuts the slope at a single operation, trimming them from guide-ways, absolutely true to specifications and removing every particle of loose earth.

The excavating buckets travel in guide-ways, transversely of the ditch, shaving off a thin slice at each crossing, and truing the bottom and banks without disturbing in any manner the original strata of the earth.

With the banks undisturbed and exposed to the action of sun and wind they dry out, producing a baked surfacing, impervious to the action of the elements and practically indestructible—a ditch is made scientifically correct in principle and HAVING THE GREATEST POSSIBLE PERMANENCY obtainable in earth construction.

IT PRODUCES THE BERM

Delivering the excavated earth at a distance of from 10 to 15 feet from the ditch and in a position in which it will not be returned by the action of wind or erosion.

It is well known that Dipper Dredges cut vertical sides, tear up the bottom and banks and deposit the excavated earth immediately adjacent to the bank. Exposed to rain and frost, the banks cave and the waste banks are returned to the ditch by wind and erosion, requiring frequent cleaning out at an expense almost equal to the original cost of the ditch.

The Austin Drainage Excavator produces a permanent ditch which keeps its shape and at a small fraction of the cost of ditches constructed and maintained by Dipper Dredges. Write for Catalogue No. 5.

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NEW YORK OFFICE, 150 NASSAU ST.

Morris Machine Works

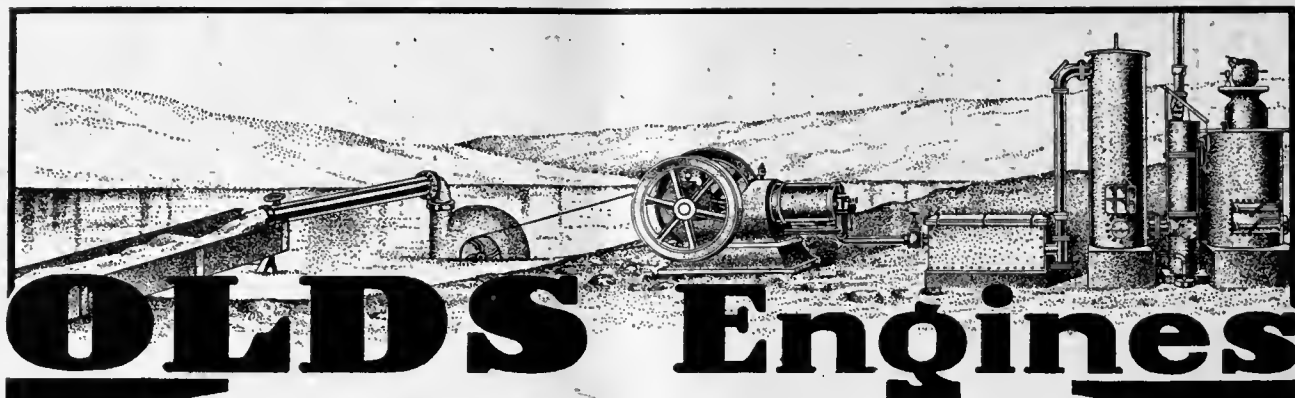
BALDWINVILLE, N. Y.

Centrifugal Pumping Machinery, designed for any irrigating proposition. Send details or specifications of what is wanted and we will recommend a pumping outfit to supply the need

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We **know** each complete plant (producer and engine) will run right before it leaves the factory, perfectly adapted to the coals you will use. Operating costs are one-third to one-fourth of steam, one-half of gasoline. Especially adapted for irrigation work.

Three-fourths inch shells where others use one-eighth inch; every elbow, cross or tee fitted with cleaning holes, double closing charging hopper, special shaking grates that remove clinker troubles.

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The Washington Irrigation Company offer for sale the Finest Fruit Land, Hop Land, Alfalfa, Timothy and Clover Lands—Lands especially suited for truck and diversified farming and for the production of high-grade crops, from

\$60 to \$90 per acre

according to location, with water-right. Terms, one-fifth down; balance five years at 6 per cent. These lands are all watered by the

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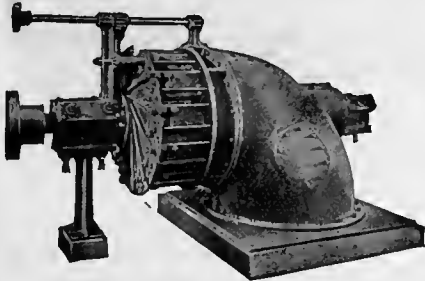
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Washington Irrigation Company
Zillah, Yakima County, Washington

STANDARD FOR SIXTY-FIVE YEARS


JOHN DEERE

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SAMSON TURBINE

When the PUMP cannot be direct connected to the turbine shaft, the power is usually transmitted by gears, shafting, etc. On account of the HIGH SPEED of the SAMSON, for a given power, lighter and consequently CHEAPER transmission machinery can be used.

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Write Department K-2 for Catalog.

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Bought in 1895—Been Running Constantly

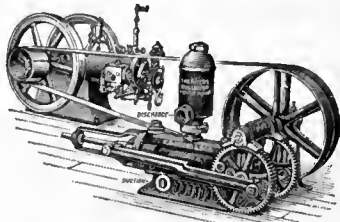
The Naugatuck News, Naugatuck, Conn., writing for supplies incidentally remarks: "The engine has been a fine one, in fact the best investment we ever made." Surely a splendid tribute to pay to a piece of machinery. "Otto" design, "Otto" materials and "Otto" workmanship combine to make "Otto" excellence. "Otto" engines can never be "cheap" yet are always the CHEAPEST



OTTO GAS ENGINE WORKS, Phila, Pa.
STANDARD OF THE WORLD

MYERS POWER PUMPS

WITHOUT AN EQUAL ON THE GLOBE



OPERATING
WITH
GAS ENGINE

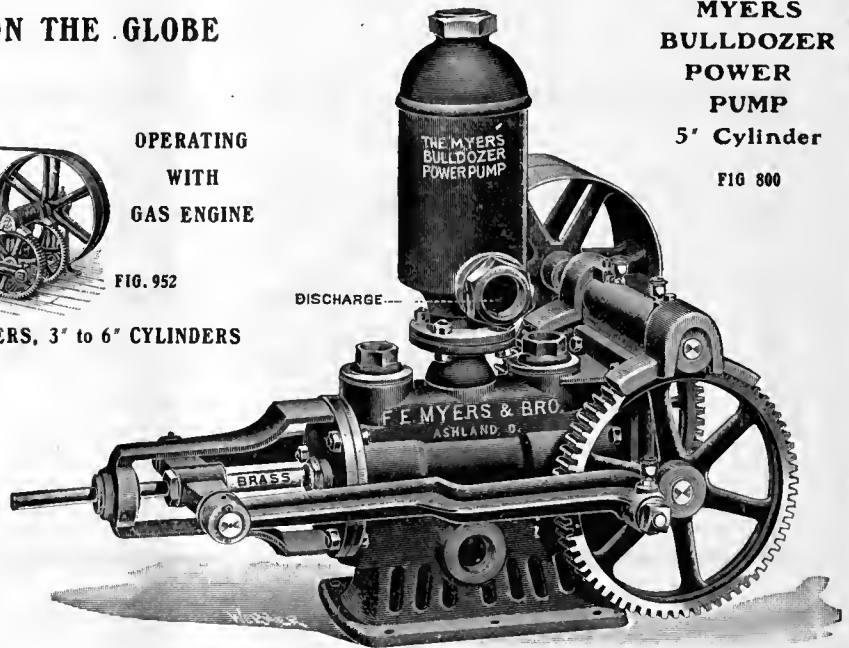
FIG. 952

HORIZONTAL BULLDOZERS, 3' to 6" CYLINDERS

MYERS
BULLDOZER
POWER
PUMP

5' Cylinder

FIG 800



MYERS
BACK GEARED
WORKING HEAD

TAPPED FOR
3" PIPE

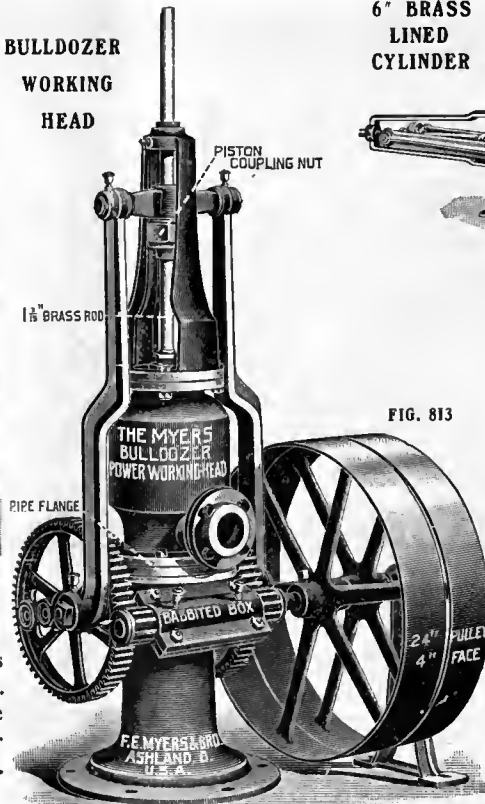
5, 7½ and 10"
STROKE

FOR
BELT, WIND OR
HAND POWER

FIG. 1113

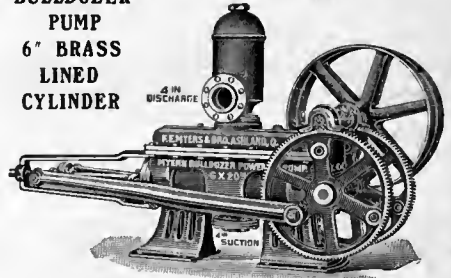


BULLDOZER
WORKING
HEAD



BULLDOZER
PUMP
6" BRASS
LINED
CYLINDER

FIG. 1079



MYERS BULLDOZER
WORKING HEADS

No. 359

5', 7½', 10' STROKE
DISCHARGE, 2½ or 3 INCHES
SUCTION 2 to 4 INCHES

No. 364

12', 16', 20' STROKE
REGULARLY FITTED 4' DIS-
CHARGE
SUCTION 8' OR LESS

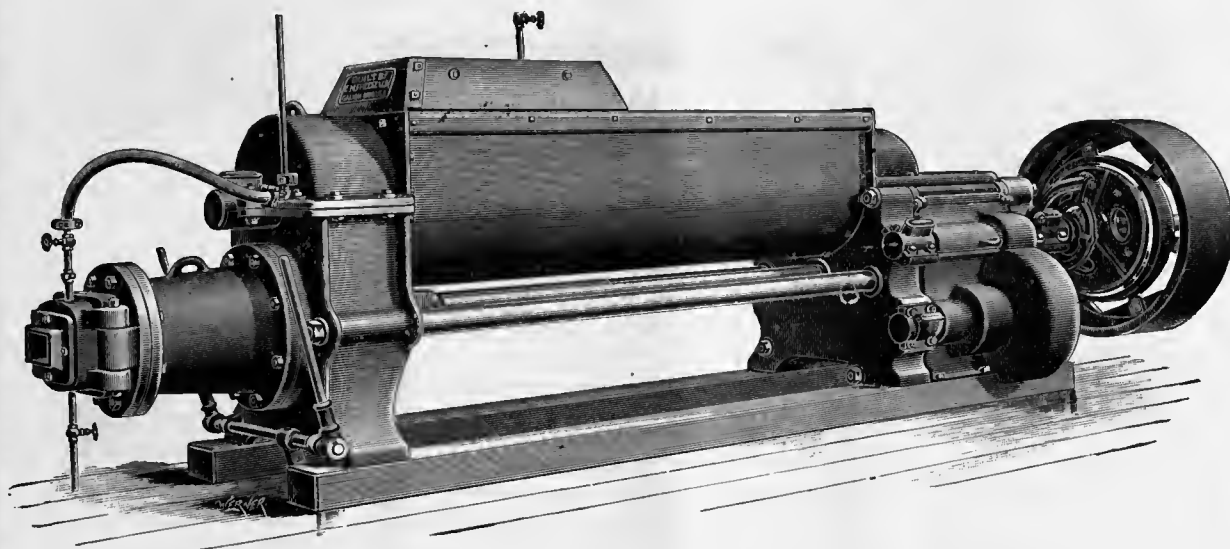
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We want you to acknowledge this Ad. so,
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Pumps. This is the proper season.
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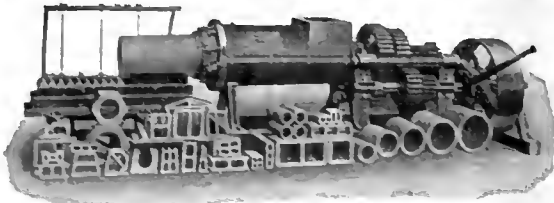


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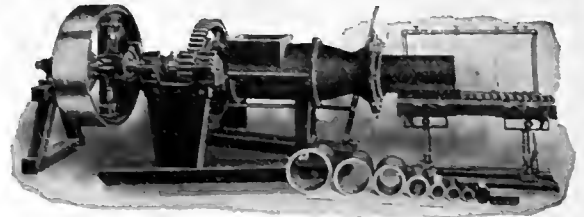
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and Paving Brick and other Clay Products

If interested write us for particulars and estimates.

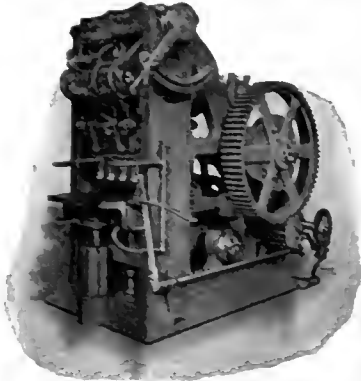
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GALION, OHIO



Centennial Auger Machine



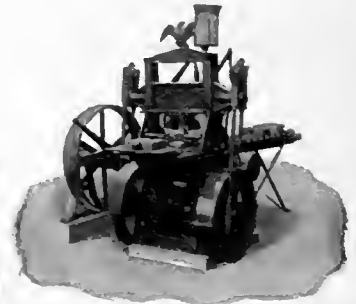
Mascot Auger Machine



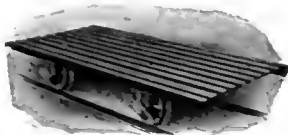
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Wheelbarrows and Trucks



Eagle Repress



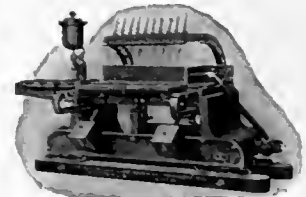
Dry Cars, all kinds

Clay Working Machinery

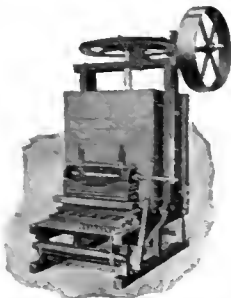
**"BUILT RIGHT—
RUN RIGHT"**

We build an entire line of Clay Working Machinery for the manufacture of Clay products by all processes, including Sand-Line Brick. Our yard supplies are the best. Kiln Irons, Cutting Wire and all supplies. Send for information or catalogue.

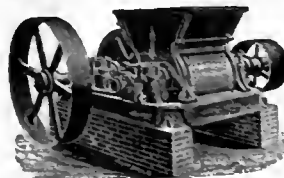
**The American Clay
Mch. Co...Bucyrus, Ohio**



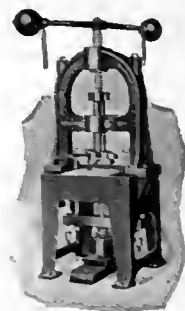
Hand and Power Cutters



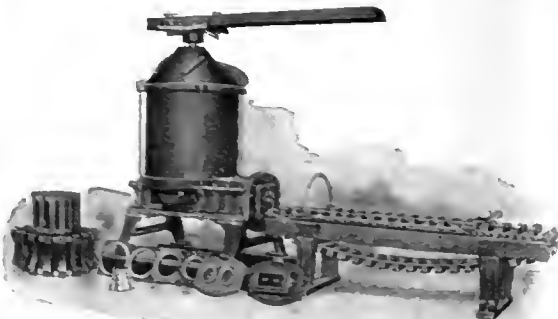
Soft Mud Machines, Horse and Steam Power



Disintegrators



Hand Power Screw Press



Horse Power Plunger Machine



Products of our Auger Machines

THE IRRIGATION AGE

VOL. XXI

CHICAGO, SEPTEMBER, 1906.

NO. 11

THE IRRIGATION AGE

With which is Merged

MODERN IRRIGATION
THE IRRIGATION ERA
ARID AMERICA

THE DRAINAGE JOURNAL
MID-WEST
THE FARM HERALD

THE D. H. ANDERSON PUBLISHING CO.,

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112 Dearborn Street, CHICAGO

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D. H. ANDERSON, Editor

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Associate Editors

ANNOUNCEMENT.

"The Primer of Irrigation" is now ready for delivery. Price, \$2.00. If ordered in connection with subscription, the price is \$1.50.

SUBSCRIPTION PRICE.

To United States Subscribers, Postage Paid,	\$1.00
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Official organ of the American Irrigation Federation.
Office of the Secretary, 309 Boyce Building, Chicago.

Interesting to Advertisers.

It may interest advertisers to know that The Irrigation Age is the only publication in the world having an actual paid in advance circulation among individual irrigators and large irrigation corporations. It is read regularly by all interested in this subject and has readers in all parts of the world. The Irrigation Age is 21 years old and is the pioneer publication of its class in the world.

Cause of Delay.

The last forms of this issue of THE IRRIGATION AGE were held open for the report of the fourteenth National Irrigation Congress, held at Boise, Idaho, September 3 to 8, which prevented us from getting the paper into the mail at the usual time. We believe, however, that our readers would rather have the AGE issued a few days late than miss the many good features that are to be found in this number.

Boise Hospitality.

One of the most pleasing features of the late Irrigation Congress was the hospitality and general good treatment of the delegates by the citizens of Boise. It is doubtful if there has ever been a time when some of the delegates to former meetings were not displeased by poor accommodations. So far as we are able to learn, no complaint has been entered on that score against Boise or any of her hotels or other places where the delegates were housed. The Idan-ha Hotel, the principal hostelry of the city, which was the social and general headquarters of the Congress, has been highly praised by delegates and officers alike. The management of this hotel, which is in the hands of Mr. and Mrs. Schubert, did everything in their power to further the comfort of guests, and no complaint has been registered by any who were entertained under its roof. When the immense number of people taken care of by this hotel is considered, this is a remarkable record. The owners of the hotel as well as Mr. and Mrs. Schubert are entitled to great praise.

Conference of Engineers.

The fourth annual conference of the Engineers of the United States Reclamation Service was held at Boise, Idaho, September 3 to 8, the Fourteenth Irrigation Congress also being in session at Boise at that time.

This conference was in continuation of the general policy of holding annually a meeting of the principal engineers of the Reclamation Service for the purpose of discussing matters of administration and economies of work. The bringing together of these engineers and prominent citizens of the West make possible an interchange of views and a discussion of data leading to results of very great value in the furtherance of the purposes of the Reclamation Act.

Each of the engineers, experts and specialists in various lines submitted a brief paper embracing some point of general interest, such as detailed methods of cost keeping, of designing, construction, maintenance, or operation. Owing to the advanced condition of many of the irrigation projects now under construction, it is expected that this conference will be of more than usual interest and importance.

Submarine Farms.

A good clam farm is worth anywhere from \$500 to \$2,000 an acre—more, indeed, than most tillable dry land. It is under water half the time, of course, and the crop has to be gathered between tides. But no fertilizers are needed, and when once the area is in a productive condition it will go on planting itself. All the farmer has to do is to avoid digging over too often.

**Pacific
Coast Banks.**

Banks in Pacific coast cities, outside of San Francisco, report deposits largely increased, prosperity unprecedented, and all industries flourishing. Banks in that section are entirely independent and are large lenders of money in the East. In San Francisco there is great activity and the volume of business is satisfactory. Banks are full of money, deposits are larger than at the time of the fire, and clearings have enormously increased. Large numbers of persons who fled after the fire are returning.

**Engineers
Needed.**

The Reclamation Service has need of several constructing engineers of experience in earth work, tunneling, concrete masonry and similar operations. It has called upon the Civil Service Commission for an examination to be held on October 1st to secure eligibles.

This in the general form is similar to a previous examination held on April 1, 1904, from which a large number of engineers have been selected. The examination does not necessitate the appearance of the candidates at any particular place, but on the contrary papers are to be prepared and sent to the commission to be received by them before October 1st. Markings will be made on the basis of the paper submitted, especial weight being given to experience in one or more of the various lines of construction work.

The salary offered at first is from \$150 to \$250 per month, and will be determined with reference to the particular work to be done and the ability of the eligibles for the work.

The general theory of the examination is based upon the assumption that the men who have had practical experience in construction will probably be rusty upon mathematics and theoretical lines of engineering outside of their immediate practice. It is not desired to obtain scholars or professors of engineering, but on the contrary to pick out men who, whatever their theoretical education may have been, have shown ability in handling the men and materials and in producing results.

An excellent opportunity is offered to competent and experienced men, particularly those of middle age who have had ten years' or more experience on construction.

**Another
Land
Opening.**

The grand army of the land hungry never seems to diminish. A month ago a company many thousands strong made a grand rush for the towns in eastern Montana, where offices were opened for registration of persons desiring "a chance" in the Crow reservation lands; and now an equal rush is on for the lands soon to be thrown open to settlement of the Wind River reservation, in Wyoming. The tract to be opened comprises a total area of about 1,000,000 acres. Of this

area, between 265,000 and 300,000 acres are capable of being made productive by irrigation. The large residue is the wildest of wild land, mountainous and arid and forbidding in aspect, but it is attractive to the landless—in anticipation at least—and there is always the hope under the present system of registration and drawing of getting something really worth while.

Settlement upon such lands is necessarily beset with hardship. The climate of the Rocky Mountain region is rigorous; irrigation is necessary to make these lands certainly productive; the most rigid economy is required for the man of small means or practically no means to get a start; social conditions are far from ideal; and, all things considered, it is no wonder that many settlers grow homesick and discouraged and abandon the holdings they were so anxious to secure.

A propitious feature of the opening of the Wind River reservation, the drawing for which closed August 15th, is a carefully devised irrigation scheme under the auspices of the State, insuring water rights to the settlers and a supply equal to their needs at a cost less than that for which each could build his own dam and ditches.

Boundary lines and water rights are the burning questions on the frontier. Encroachments, on one or the other, real or fancied, has caused feuds that have led up to murder in many instances, and upon these questions the individual can only see his side of the contention. Hence a careful and recent government survey, with lines clearly established, and an irrigation scheme engineered by the State, are elements of value in settling a body of new land. The settlers on the Wind River reservation are fortunate in these respects and should conquer the desert and make it blossom into homes with less friction and delay than usually follow the occupation of new lands.

Government reports indicate a continuance of the prosperity which the country has experienced for several years. The grain crop of 1906 contents the farmers.

The total wheat crop is estimated at 760,000,000 bushels, an increase of about 10 per cent over last year. The corn crop is estimated at 2,655,000,000 bushels. Other grains, except oats, show an increase. This means that the farmer will have more money to spend, and all lines of trade will share in the benefit of abundant harvests.

A part of the excess of this year's crop over last year's will be needed on account of the increased population of the United States. The million immigrants who have made this country their homes since last summer must be fed. The babies are growing up and the births exceed the deaths. If there should be stagnation in trade men might be compelled to eat less meat, fruit, early vegetables, and other luxuries, but they would eat

even more bread and other preparations of grain. There is no reason to fear stagnation in trade, but whatever happens, a large part of the grain crop will be consumed at home and the foreign demand will take all that is left.

Already it is predicted that there will not be freight cars enough to move the crops, but when the need comes the railroads probably will have solved the difficulty. If not, men can treat a portion of the crop in the way in which the mountaineers have been doing, with some modifications. Difficulty of transportation of grain across the mountains was the prime reason why the dwellers on the western slopes and spurs of the Appalachian ranges fell into the habit of converting their grain into spirit which could be easily transported and which, if kept on hand for some time, only improved with age. The last session of Congress resulted in the passage of a law removing the tax from denatured alcohol, and opened up a way for the farmer to utilize his surplus grain in case he can not ship it, or in case the market price does not make it worth his while to ship it. Every little community will soon have its distillery where grains, fruits, potatoes, beets, and other vegetables capable of producing alcohol can be transformed. A great bulk will be reduced to a small one, and the farmer will be able to carry home from the nearest town a liquid which is the cheapest and handiest source of heat, light, and power. The biggest crop of grain yet produced in the United States is coincident with a vast new field for the use of grain.

At the recent primaries held in Nebraska, Mr. G. L. Shumway was nominated for Congress to represent the sixth district of that State, which is known as the Big Six,

and embraces about one-half the area of the commonwealth. Mr. Shumway was born near New Windsor, Ill., March 7, 1865. He removed to Nebraska in 1885, locating the following year in Cheyenne county, which was afterward divided into five counties, of which Banner and Scotts Bluff were two, where he has spent most of his recent years. While always public spirited to a liberal degree and well known in the councils of his party in Nebraska, special notice was attracted to his abilities a year ago when he suddenly came to the fore at the National Irrigation Congress. Subsequent events have emphasized the clearness of his vision, and stamped him as one who is worthy of every confidence. During the campaign Mr. Shumway will not contribute his usual quota of articles to THE IRRIGATION AGE.

\$2.50 will secure for you one year's subscription to THE IRRIGATION AGE and a finely bound volume of the Primer of Irrigation which will be sent postpaid in a few months, when volume is completed. The Primer of Irrigation will be finely illustrated and will contain about 300 pages. Send post office or express money order for \$2.50 and secure copy of first edition.

Good Security. "Buffalo Bill" was once exhibiting in Boston, and while giving a little reception at his tent at the close of the afternoon performance he was approached by a young man and his mother. After a moment of embarrassment on the lady's part she said:

"Do you consider that you give a true picture of western life?"

"We try to, madam," answered Mr. Cody.

"The people really ride about and shoot in that terrific manner, do they?" she continued.

"Well, yes; on occasion," the showman replied, rather more guardedly.

"I never suspected it," went on the lady in some agitation. "Most of the money left me by my husband is invested in the West, but I now feel doubtful about allowing any more of it to go there."

"Is it secured by first-class real estate mortgage?"

"I believe so."

"Madam," said Cody with confidence, "do not give yourself the least uneasiness. In all my experience with the West I have never yet seen a first mortgage on real estate riding a bucking broncho, shooting up the town, or doing anything except grimly drawing its 12 per cent per annum. I wish I owned a million of 'em."

The waste from the mill runs the electric lighting plant for Albuquerque, whose **Utilizing Waste Water.** owners are talking of selling electric power to run pumps for irrigation throughout the valley in which Albuquerque lies. Down in the Mesilla Valley, where the farmers have raised huge crops of alfalfa, grain and fruits in good years, the Government is pushing forward the Elephant Butte Dam project to impound the water that runs to waste in the spring; and, when that is completed, agriculture will be as certain an enterprise there as an ideal climate for crops can make it. Already settlers from Texas are flocking into the valley to take up the small allotments permitted under the provisions of the irrigation project; for one acre of irrigated land in that climate is as productive as four in a land of rainfall. Similar irrigation projects are under way in other parts of the territory—the Hondo, the La Plata, and the Las Vegas projects—and many acres are irrigated by private enterprise. The Estancia Valley already has a reputation for its fruits, and the orchards of Colfax are a delight to the eye. When the irrigation works now being pushed are completed, New Mexico's agricultural output will be considerable. Water is the prime necessity, and there is plenty of water if it can only be controlled, or pumped up. In places it is but a little way under the ground. Deming, near the Mexican line, is a little paradise of green fields and whirling windmills. For years one of its leading products was water, which was sent by railroad to El Paso, Tex., and sold there.

FOURTEENTH NATIONAL IRRIGATION CONGRESS

The Most Successful Congress in the History of the Organization—Next Meeting Place Sacramento, Cal.

The sessions of the Fourteenth National Irrigation Congress were opened at Riverside Park Theater, Boise, Idaho, at 11 a. m., September 3, with a large number of delegates in attendance. Thirty states and territories were represented, the actual number of delegates who signed the register being 1,125, while the number of accredited ones exceeded 2,000.

Boise is an ideal city in which to hold an irrigation congress, for to irrigation the city owes both its pic-

The Reclamation Service, Agricultural Department and State Engineers, as well as Federal and state officers participating in the proceedings acquitted themselves with great credit.

In the absence of President Geo. C. Pardee, First Vice-President L. W. Shurtliff, of Ogden, called the congress to order.

Vice-President Shurtliff in opening the meeting said: "Ladies and Gentlemen of the Fourteenth Irriga-



Vice-President Charles Warren Fairbanks.

turesque beauty and its large commercial interests. The city now has a population of some 20,000, and is steadily growing. It is the commercial center of 400 square miles of territory, rich in agricultural and mineral resources. In the territory tributary to this point, there are thousands of acres of fertile lands that have been reclaimed by means of irrigation; hence this was an ideal place for the irrigationists to assemble for study and discussion. The fourteenth congress will go into history as being the best in point of work ever held.

tion Congress: It becomes my duty to call this assemblage to order. I regret that we have not with us the president of the congress, Governor Pardee. Therefore, I shall not attempt to make any speech in any way, but say that I am here with you upon this occasion in the Gem state to consider questions of great importance not only to our arid country, but all the world."

Chairman Shurtliff then introduced Hon. James A. Pinney, mayor of Boise, who welcomed the delegates. Governor Gooding was next introduced, and on be-

half of the state, welcomed the delegates in a manner that elicited much favorable comment. His manner and remarks were particularly happy and appropriate. The governor spoke as follows:

"It is my good fortune to have the honor of extending to you a hearty welcome on behalf of the people of this young commonwealth. The people of Idaho rejoice at your presence here today, for they feel that through the efforts of this organization in the past, much has been done to assist in the development of our state. We owe you a debt of gratitude, and we are glad of this occasion to welcome you to our state, where you will have an opportunity to see what has been done in reclaiming our arid lands.

"It can truthfully be said that the great develop-



Governor George E. Chamberlain of Oregon, President Fifteenth National Irrigation Congress.

ment of our arid lands commenced with the birth of this organization. Fourteen years ago, when the first session of the National Irrigation congress was held in Salt Lake City, irrigation was in its infancy in Idaho. No great projects had then been undertaken. Largely through the efforts of this organization the eyes of the nation were turned toward the arid West. The whole world has been convinced that what was known as the Great American Desert is a myth; that in the arid belt there is a solid soil so rich in productiveness that it can not be surpassed in any part of the United States. Idaho has reaped a rich harvest from the work of this

organization. Men of wealth have been attracted by our great possibilities, and have come to our assistance in the development of our arid lands. Year by year we have grown, until today we can boast of the greatest irrigation projects of any state in the Union. Largely through the wisdom of this organization, good laws have been passed that will some day make Idaho one of the greatest states in the Union.

"It will be a pleasure to show you the construction work now going on under Government supervision in this beautiful valley, and that will reclaim more than 350,000 acres of as rich land as can be found in any place in the Union. You will be shown the Minidoka project that can be called in its true sense a Government project, for no homesteader had the temerity to take up a single acre of the land before it was thrown open for settlement under the national irrigation laws.

"This may be called the land of the homesteader, for as far as the eye can reach the homesteader's cabin can be seen on every forty or eighty acres of this beautiful land. There you will have an opportunity to see a practical demonstration of what our national irrigation laws mean, and the splendid work that is being done by the Reclamation Service.

"Under the Minidoka project there are 140,000 acres to be reclaimed. The great dam across Snake river is practically completed; the main canals and laterals are now in course of construction. Sixty thousand acres will have to be served by pumping plant, that it is hoped will be installed in the near future. There is a sad story connected with this part of the Minidoka project, of which you will have an opportunity to learn before you leave Idaho. When the story is told, I am confident we shall have the hearty co-operation of this organization in bringing about a satisfactory solution of this important question to the homesteader, who is watching and waiting for water with which to reclaim his land.

"It will be our pleasure to show you the Twin Falls project that is being reclaimed under the Carey act, which, when completed, will irrigate more lands than any other single project in the United States. The success of this enterprise can not be told in words. You must see for yourselves to understand the great transformation that has taken place there within two short years. Where a short time ago was a barren dessert, there are now beautiful homes and waving fields of grain. Cities have sprung almost like magic. The course of the great Snake river has been changed and its water poured out upon the thirsty lands which have responded by a productiveness that can not be excelled in any part of our state. For the first time since the water ran down the channel of the mighty Snake, when the massive gates of the Twin Falls dam were closed, the bed of that great river shown bare in the winter sun.

"It will be a pleasure to show you the upper Snake river valley, which is an empire within itself. It was after traveling over this part of Idaho six years ago that President Roosevelt, in the little city of St. Anthony, made his first promise to the West that if elected Vice-President he would do all in his power to assist in the passage of the national irrigation law. We all know how well that promise has been kept. In his great work for the West he has built a monument to his name that will endure for all time.

"What could be more appropriate than that you should come to Idaho for the fourteenth session of the congress, and here see the results of your efforts in the

upbuilding of the arid West? This beautiful city is located almost in the heart of the great valley of the Snake river, which furnished more water for irrigation than any other stream in the arid belt, and with a system of reservoirs now in course of construction, more land will be put under irrigation in the Snake river valley and its tributaries than in any other state in the Union. Although a great work has already been accomplished by your organization, as yet you have only made a beginning. It is in your future work that the hope of the West lies.

"Again, ladies and gentlemen, I want to assure you that the hearts of the people of Idaho are with you. I

effectiveness. Construction is already well advanced on twenty-three great enterprises in the arid states and territories. Over 1,000,000 acres of land have been laid out for irrigation, and of this 200,000 acres are now under ditch; 800 miles of canals and ditches and 30,000 feet of tunnel have been completed; and 16,000,000 cubic yards of earth and 3,000,000 cubic yards of rock have been moved. Detailed topographic surveys have been extended over 10,000 square miles of country within which the reclamation work is located, and 20,000 miles of level lines have been run. Three hundred buildings, including offices and sleeping quarters for workmen, have been erected by the Reclamation Service,



Hon. Montie B. Gwinn, Chairman Executive Committee, Fourteenth National Irrigation Congress.

sincerely trust that your visit here will be a pleasant one, and that it will give you much encouragement in the great work you have before you in the development of the arid region of our country."

Senators Dubois and Carter addressed the congress.

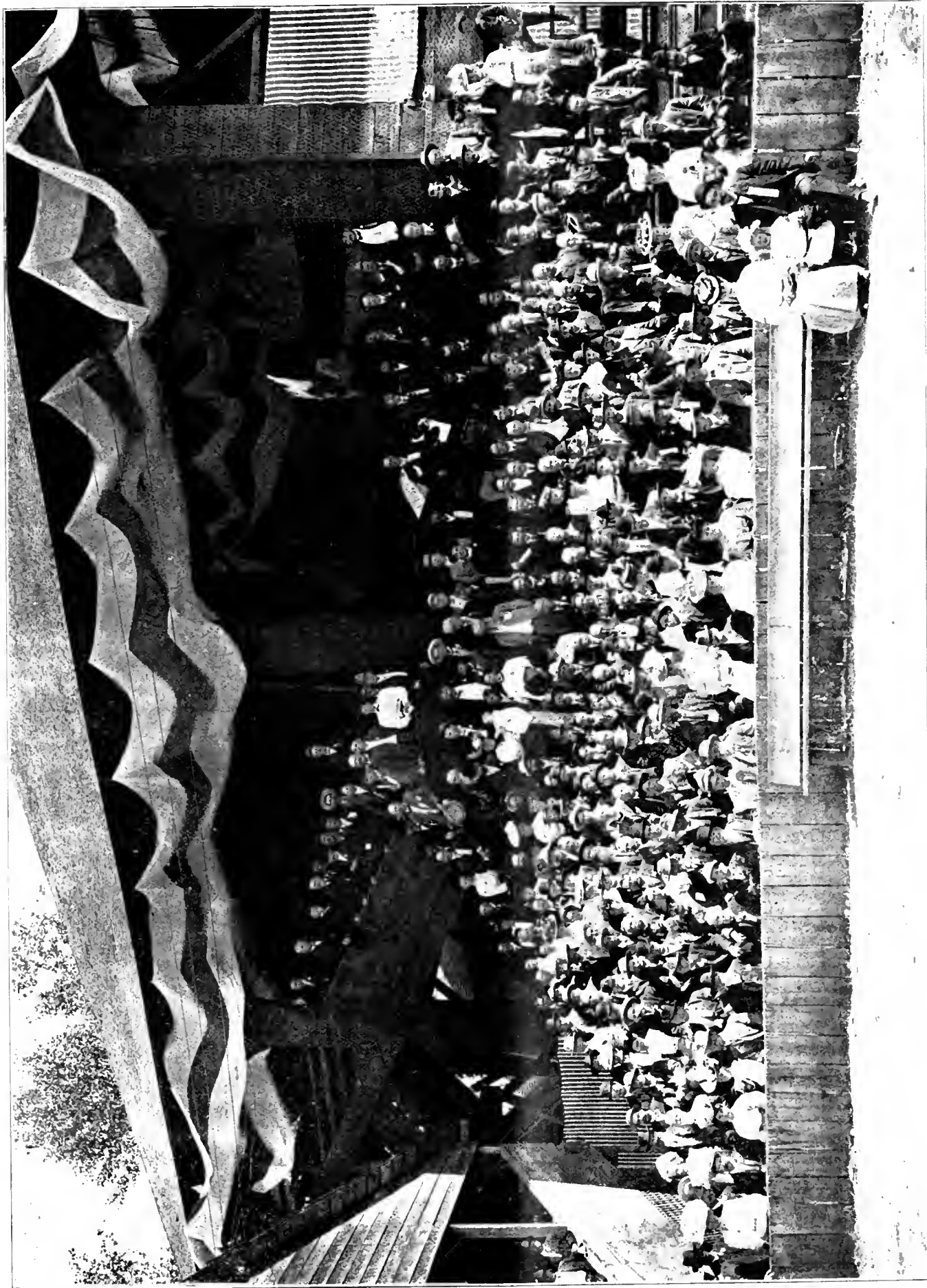
The message of greeting from President Roosevelt, which follows, was then read.

To the Officers and Members of the Irrigation Congress, Boise, Idaho: Operations under the Reclamation Act, which I signed on June 17, 1902, have been carried on energetically during the four years since that date. The Reclamation Service, consisting of over 400 skilled engineers and experts in various lines, has been organized, and it is now handling the work with rapidity and

and about an equal number by the contractors. Over 10,000 men and about 5,000 horses are at present employed.

The period of general surveys and examinations for projects is past. Effort is now concentrated in getting the water upon a sufficient area of irrigable land in each project to put it on a revenue-producing basis. To bring all the projects to this point will require upwards of \$40,000,000, which amount; it is estimated, will be available from the receipts from the disposal of public lands for the years 1901-1908.

We may well congratulate ourselves upon the rapid progress already made, and rejoice that the infancy of the work has been safely passed. But we must not



Group of Delegates to the Fourteenth National Irrigation Congress, Boise, Idaho.

forget that there are dangers and difficulties still ahead, and that only unbroken vigilance, efficiency, integrity and good sense will suffice to prevent disaster. There is now no question as to where the work shall be done, how it shall be done, or the precise way in which the expenditures shall be made. All that is settled. There remains, however, the critical question of how best to utilize the reclaimed lands by putting them into the hands of actual cultivators and home-makers, who will return the original outlay in annual installments paid back into the reclamation fund; the question of seeing that the lands are used for homes, and not for purposes of speculation or for the building up of large fortunes.

as he can, whether he can handle it profitably or not, and whether or not it is for the interest of the community that he should have it. The prosperity of the present irrigated areas came from the subdivision of the land and the consequent intensive cultivation. With an adequate supply of water, a farm of five acres in some parts of the arid West, or of forty acres elsewhere, is as large as may be successfully tilled by one family. When, therefore, a man attempts to hold 160 acres of land completely irrigated by Government work, he is preventing others from acquiring a home, and is actually keeping down the population of the state.

Speculation in lands reclaimed by the Government



The Idan-ha Hotel, Boise, Idaho, Social and General Headquarters Fourteenth National Irrigation Congress.

This question is by no means simple. It is easy to make plans and spend money. During the time when the Government is making a great investment like this, the men in charge are praised and the rapid progress is commended. But when the time comes for the Government to demand the refund of the investment under the terms of the law, then the law itself will be put to the test, and the quality of its administration will appear.

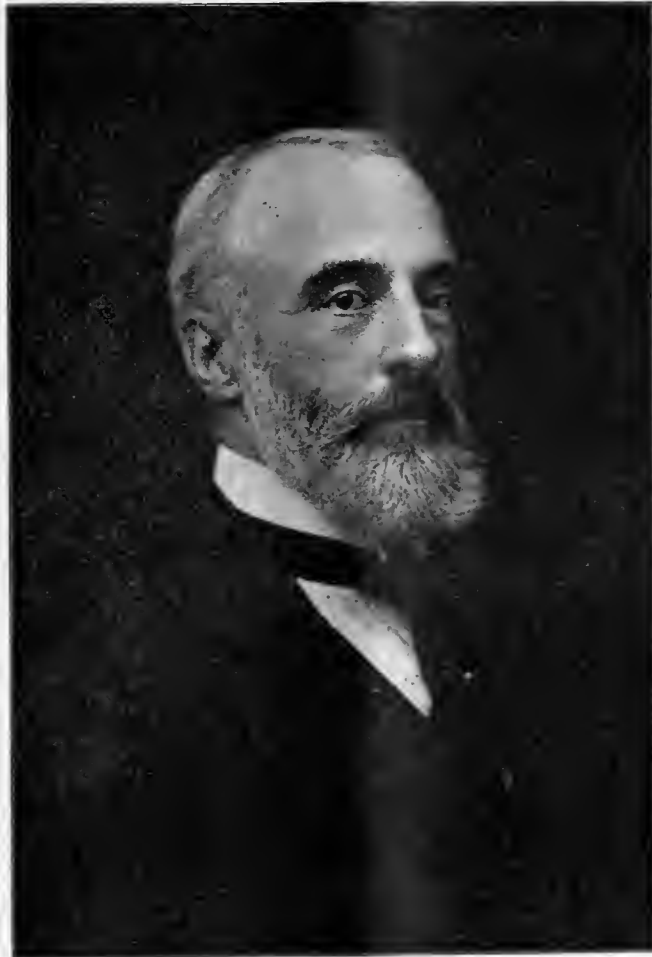
The pressing danger just now springs from the desire of nearly every man to get and hold as much land

must be checked at whatever cost. The object of the Reclamation Act is not to make money, but to make homes. Therefore, the requirement of the Reclamation Act that the size of the farm unit shall be limited in each region to the area which will comfortably support one family must be enforced in letter and in spirit. This does not mean that the farm unit shall be sufficient for the present family with its future grown children and grandchildren, but rather that during the ten years of payment the area assigned for each family shall be sufficient to support it. When once the farms

have been fully tilled by freeholders, little danger of land monopoly will remain.

This great meeting of practical irrigators should give particular attention to this problem and others of the same kind. You should, and I doubt not that you will, give your effectual support to the officers of the Government in making the Reclamation law successful in all respects, and particularly in getting back the original investment, so that the money may be used again and again in the completion of other projects and thus in the general extension of prosperity in the West. Until it has been proved that this great investment of \$40,000,000 in irrigation made by the Government will be returning to the treasury, it is

vigorous purpose to make every resource of the forest reserves contribute in the highest degree to the permanent prosperity of the people who depend upon them. If ever the time should come when the western forests are destroyed, there will disappear with them the prosperity of the stockman, the miner, the lumberman, and the railroads, and, most important of all, the small ranchman who cultivates his own land. I know that you are with me in the intention to preserve the timber, the water, and the grass by using them fully, but wisely and conservatively. We propose to do this through the freest and most cordial co-operation between the Government and every man who is in sympathy with this policy, the wisdom of which no man



Hon. George E. Barstow, Barstow, Tex., Third Vice-President Fifteenth National Irrigation Congress.

useless to expect that the people of the country will consider direct appropriations for the work. Let us give the Reclamation Service a chance to utilize the present investment a second time before discussing such increase. I look forward with great confidence to the result.

By the side of the Reclamation Service there has grown up another service of no less interest and value to you of the West. This is the Forest Service, which was created when the charge of the forest reserves was transferred from the Interior Department to the Department of Agriculture. The forest policy of the administration, which the Forest Service is engaged in carrying out, is based, as I have often said, on the

who knows the facts can for a moment doubt.

It is now less than two years since the Forest Service was established. It had a great task before it—to create or reorganize the service on a hundred forest reserves and to ascertain and meet the very different local conditions and local needs all over the West. This task is not finished, and of course it could not have been finished in so short a time. But the work has been carried forward with energy and intelligence, and enough has been done to show how our forest policy is working out.

The result of first importance to you as irrigators is this: The Forest Service has proved that forest fires can be controlled, by controlling them. Only one-tenth

of 1 per cent of the area of the forest reserves was burned over in 1905. This achievement was due both to the Forest Service and to the effective assistance of settlers and others in and near the reserves. Everything the Government has ever spent upon its forest work is a small price to pay for the knowledge that the streams which make your prosperity can be and are being freed from the ever-present threat of forest fires.

The long-standing and formerly bitter differences between the stockmen and the forest officers are nearly all settled. Those which remain are in process of settlement. Heartly co-operation exists almost everywhere between the officers of the Forest Service and the local associations of stockmen, who are appointing advisory committees which are systematically consulted by the Forest Service on all questions in which they are concerned. This most satisfactory condition of mutual help will be as welcome to you as it is to the administration and to the stockmen. To the stockmen it means more, and more certain, grass; to you, because of the better protection and wiser use of the range, it means steadier stream-flow and more water.

The sales of forest-reserve timber to settlers, miners, lumbermen, and other users are increasing very rapidly, and in that way also the reserves are successfully meeting a growing need.

Lands in the forest reserves that are more valuable for agriculture than for forest purposes are being opened to settlement and entry as fast as their agricultural character can be ascertained. There is therefore no longer excuse for saying that the reserves retard the legitimate settlement and development of the country. On the contrary, they promote and sustain that development, and they will do so in no way more powerfully than through their direct contributions to the schools and roads. Ten per cent of all the money received from the forest reserves goes to the states for the use of the counties in which the reserves lie, to be used for schools and roads. The amount of this contribution is nearly \$70,000 for the first year. It will grow steadily larger, and will form a certain and permanent source of income, which would not have been the case with the taxes whose place it takes.

Finally, a body of intelligent, practical, well-trained men, citizens of the West, is being built up—men in whose hands the public interests, including your own, are and will be safe.

All these results are good; but they have not been achieved by the Forest Service alone. On the contrary, they represent also the needs and suggestions of the people of the whole West. They embody constant changes and adjustments to meet these suggestions and needs. The forest policy of the Government in the West has now become what the West desired it to be. It is a national policy—wider than the boundaries of any state, and larger than the interests of any single industry. Of course it can not give any set of men exactly what they would choose. Undoubtedly the irrigator would often like to have less stock on his watersheds, while the stockman wants more. The lumberman would like to cut more timber, the settler and the miner would often like him to cut less. The county authorities want to see more money coming in for schools and roads, while the lumberman and stockman object to the rise in value of timber and grass. But the interests of the people as a whole are, I repeat, safe in the hands of the Forest Service.

By keeping the public forests in the public hands our forest policy substitutes the good of the whole people for the profits of the privileged few. With that result none will quarrel except the men who are losing the chance of personal profit at the public expense.

Our western forest policy is based upon meeting the wishes of the best public sentiment of the whole West. It proposes to create new reserves wherever forest lands still vacant are found in the public domain, and to give the reserves already made the highest possible usefulness to all the people. So far our promises to the people in regard to it have all been made good; and I have faith that this policy will be carried to successful completion, because I believe that the people of the West are behind it.

Sincerely yours,

THEODORE ROOSEVELT.

Vice-President Fairbanks addressed the Congress as follows:

"Mr. President and Members of the National Irrigation Congress: It is impossible to exaggerate the importance of the work in which you are engaged. It is fraught with far-reaching interest, not only to the present but to the future. It is a subject to which I have given considerable attention during my public service, for I have been a firm believer in the feasibility of national irrigation, as now contemplated, in the arid and semi-arid regions. It will bring under cultivation large areas of the public domain which would otherwise remain sterile and practically uninhabitable.

"The rapid increase of population and the pre-emption and settlement of the arable portions of the public lands has rendered it important that we should reclaim the waste places and make them productive through a wise irrigation system which lies beyond the capacity of individual effort. This policy is in the highest degree beneficent. It not only enlarges the field of wholesome, individual opportunity, but it is in a very especial degree of national significance. It increases the opportunity for the development of the agricultural regions of the republic, for multiplying the number of American farms and American homes, thereby augmenting the great conservative forces which are the surest reliance and safeguard of our political institutions. I firmly believe that the most conservative elements will always be found upon the farm. You will generally find among the millions throughout the great agricultural regions less tendency than elsewhere to inconsiderate and hysterical judgment.

"The general subject which is under consideration is one of those great practical, everyday questions which requires the application of good business sense. The real benefactor, we understand, is the one who makes two blades of grass grow where one grew before. Those who have been engaged in the promotion of irrigation fall most distinctly within this definition and are benefactors of their day and kind. They have the satisfaction of knowing that they have in a measure promoted the interest and welfare of the home-makers. The home-builders of America have been and are as a rule a hardy people, in love with nature and enamored of grown up anothiiiiirv|biii cmfwrld cmfrd cmfwyp ppp their institutions. They have thus far overcome many of the seemingly impossible obstacles of nature in the great arid and semi-arid regions, and have erected their habitation and made prosperous and happy neigh-

borhoods. They are entitled to all success in their beneficent enterprise. Some of our wisest statesmen, of a not very remote past, had but little conception of the possibilities which many of you have opened up to our country and our civilization. We may well believe that, with our larger experience and greater light, we have as inadequate a conception of the vast possibilities of this western section of the country as many of our predecessors had of the large development which has already been accomplished. The growth of irrigation thus far is largely due to individual and corporate enterprise. It has been carried on by our people for many years in a more or less satisfactory way, but it has not been until recently the subject of national consideration. No one can appreciate the magnitude and the possibilities of the reclamation service in which the national government is engaged and which you are met to encourage, who has not looked upon what irrigation has already accomplished. Go into the valleys of Arizona, California, Colorado, Idaho, Montana, New Mexico, Nevada, Oregon, Utah, Washington, Wyoming, and so on, and some conception can be gained of the wondrous possibilities of the future by what has already been done. Fruits, vegetables, grains and grasses of almost every variety are produced in profusion upon lands which but a few years ago seemed to the casual observer absolutely valueless and beyond the hope of cultivation. I have observed in many places, to employ the language of Whittier,

* * * orchards sweep
Apple and fruit trees fruited deep
Fair as the garden of the Lord.

"Irrigated lands are made to yield manyfold more than the best unirrigated lands and the certainty of good crops seems to be assured. There is a guaranty against the blighting effects of drouth, and the intelligent husbandman is certain of a bountiful yield as the fruit of his industry. The desert is fast disappearing before the magic touch of American genius, thrift and pluck. What a few years ago seemed to be impossible is now being accomplished. It has been demonstrated that there is no investment which has yielded better or surer results than money spent in the construction of feasible irrigation works. It is estimated that some ten millions of acres are now irrigated through individual and corporate effort and that the value of our agricultural products has been thereby increased in the sum of more than an hundred and fifty millions of dollars per annum. It is also estimated that this annual increase is in excess of the total cost of irrigation works through which it is made possible.

"When we consider, in addition to the large money value of the increased annual yield through irrigation, the many incidental benefits resulting from, the magnitude and importance of the subject of national irrigation can be more fully appreciated.

"The government has not entered upon the subject of irrigation hastily and without the utmost consideration. The matter has been thoroughly debated and considered in its physical and economic aspects. When it was first suggested it was regarded by those who had given it only a superficial consideration, as impracticable and as involving a tremendous and unnecessary drain upon the national treasury. The fact was that individual and corporate enterprises had carried the work forward as far as it could reasonably do so.

The larger and more difficult propositions awaited the action of the national government.

"The existing irrigation law was put upon the statute books in 1902. The law is founded upon an entirely rational and defensible theory. It is entirely just and equitable. None better has been enacted by the congress of the United States in recent years.

"It provides substantially that the money arising from the sale of public lands shall be set apart in a special fund to be used exclusively for irrigation purposes. The money so derived is to be expended in the establishment and construction of irrigation works and is to become a charge upon the land benefited, and is to be repaid to the government by the land owner in not more than ten annual payments. It is returned to the reclamation fund and is to be again used in the inauguration and development of new irrigation projects. In short, the fund becomes an endless chain extending its blessings to future years. Not a dollar comes out of the pockets of the taxpayers of the country to promote this great work. It is estimated that the amount to the credit of the reclamation service at the close of the fiscal year 1908 will be \$41,441,572.95.

"Irrigation by the national government has been undertaken so recently that its beneficent results have not yet been felt. The secretary of the interior has authorized the construction of many projects in the states of California, Idaho, Colorado, Kansas, Montana, Nebraska, Nevada, North Dakota, Oregon, South Dakota, Utah, Washington and Wyoming and in the territories of Arizona, New Mexico and Oklahoma.

"The first allotment for such construction is about \$41,441,572.95, and when this expenditure is made it will bring under irrigation nearly 1,200,000 acres. It will be observed that the cost of the work now authorized is equivalent to the estimated amount of the reclamation fund in 1908. This will not, however, complete the work. It will require some sixty millions of dollars in addition to finish the projects now undertaken, and when they are completed the total amount of land irrigated will be 3,200,000 acres.

"The secretary of the interior has under consideration additional projects in Arizona, California, Colorado, Idaho, Montana, New Mexico, Nevada, Oklahoma, Oregon, Utah, Washington and Wyoming, which will cost about \$109,000,000, and which, when completed, will bring under irrigation 3,070,000 acres. It will thus be seen that when the government completes the work it will render arable nearly 6,300,000 acres, at a cost of a little more than \$200,000,000.

"To prosecute the work which it has undertaken and which lies before it, the government will have in hand, as heretofore observed, nearly forty-one and a half million dollars in 1908, an amount sufficient to cover the first unit of cost of projects authorized, and for thereafter prosecuting the work it will have the proceeds derived from the future sales of the public domain and the return from the land theretofore irrigated.

"It was the purpose of the authors of the reclamation act that irrigation undertaken by the national government should not be entered upon for the benefit of mere speculators. It was their purpose that the public domain and the proceeds arising from its sale should be appropriated absolutely and entirely for the benefit of homeseekers. The law wisely provides that

the limit of area per entry upon the lands irrigable shall be restricted to what would be reasonably required for the support of a family. In order that the entry-man may enjoy the benefit of the law, actual and continued residence on the land is required.

"It is obviously the purpose of the great measure, and it is one of its most commendable features, to insure homes to the greatest number of persons, and to bring soil now sterile under a high state of cultivation and productiveness for their benefit and for the benefit of the entire country.

"I believe that irrigation is only in the preliminary stages of its development in the United States. Much has been done, it is true. There is, however, a vast deal more to be accomplished. There are many millions of acres still lying within the arid and semi-arid regions which are non-productive, and which may, in due time, be irrigated. This area is of indefinite extent. It is variously estimated at from fifty to one hundred millions of acres. Of course, the acreage which may be irrigated will depend in a large degree upon the quantity of water which can be stored in the great reservoir systems to be established. The best opinion would seem to indicate that it is reasonably certain that sufficient water may be obtained for irrigating at least fifty millions of acres. Twenty millions of acres of this tremendous area is yet a part of the public domain. When the whole is brought under cultivation by means of irrigation the wealth of the nation will be increased \$5,000,000,000.

"This work can not be accomplished in a day, and it will probably not be done without some mistakes. It will require time, experience, scientific skill and a large expenditure of money to do it. The field is, indeed, a vast one, and it invites our best endeavor.

"While we are concerned particularly with the extension of the irrigation service into the arid and semi-arid regions, I believe in time it will be largely increased in many other portions of the country. The waters in many of our rivers and streams, outside of the arid and semi-arid areas, will be raised and spread over many sections where the rainfall is uncertain and where crops are occasionally destroyed or reduced in yield in consequence. We can see the limit of our arable areas, but we can not see the limit of the demand of our increasing population, nor the extent of the demand of millions in foreign countries for American food supplies.

"One of the great practical questions in the future will be how to increase and conserve the productive power of our agricultural regions. Scientific irrigation on broad lines will be a factor of increasing future importance in most of the states and territories of the Union.

"It is important not only to promote the interests of irrigation, but there is a co-related subject which is worthy of consideration, and that is—How shall we reinforce and maintain at its highest efficiency the productive power of the soil? Farming is fast becoming a science and the most successful farmer is the one who understands the chemistry of the soil and the products for which it is best suited. We are making marvelous progress in every department of our domestic economy and nowhere is our advancement more marked than in the great field of agriculture."

Chief Engineer Newell, of the Reclamation Service, followed with an address on "The Progress of Na-

tional Reclamation," as follows: Ladies and gentlemen, it gives me very great pleasure to meet again for the fourteenth time some of my old friends, and to meet also a lot of new faces. Some of us have talked irrigation in season and out of season, lo! these many years, and have borne the burden of being called cranks, and having water on the brain; but I think that time and persistence have finally conquered and we are now ready to point with pride to our record. We point to the work already done. That speaks for itself. The work has now been under way four years. The law under which we are working was signed by President Roosevelt on the 17th of June, 1902, a day memorable in American history. The first thing after the passage of a law, or the putting into effect of any policy, is to create an organization and no matter how good a law is we must have men to do the work. That has been the great operation—the gathering together of men of experience, men who are sound to the core, honest, and reliable. We have not perhaps ideal men, but we have the best men we could get for the money. The government does not pay large salaries, but the interest in the work and the enthusiasm holds men at salaries far less than they could get from private parties. We are losing men to private works and to corporations, I might say, almost every day, but still we are able to keep a pretty good body of men who are loyal to the work, and loyal to each other. We have, as stated in the President's message this morning, about four hundred expert engineers of various kinds—men skilled in financial and legal matters, men who are working along to push forward as rapidly and as economically as possible the construction of work in now twenty-two or twenty-three different localities. It requires a good organization to keep the work well in hand, and prevent waste and diffusion of energy. Besides this corps, we will say of four hundred men, that form the backbone of the reclamation service, there are employed many thousand men directly or indirectly upon the work. In the President's message he puts it at 10,000; it is possibly a good average. Ten thousand men are at work today in all capacities, from digging down in the ground, handling the plow and scraper, up to the various grades of inspectors, masons, and the principal men who are directing the affairs. The work, as you know, is done almost entirely by contract. The laws of the revised statutes of the United States govern very definitely all our proceedings. Not a dollar can be expended without publicity. We must be sure that we have complied with all the requirements which over a century of experience has shown to be necessary in executing the public works in the United States. These contracts have been let in large and small amounts. There are contracts involving a million dollars and contracts involving a few hundred, but all of them must be executed in due form with bonds to be put up and forfeited in case of failure.

Now, we are having a good deal of prosperity. Wages have gone up and as wages go up efficiency of labor has gone down. The price of material is away up. Cement is 50 per cent higher than it was six months ago. Iron and steel are advancing. All of this adds to the cost of the work and to the cost to the contractor. The eight-hour day is being rigidly enforced. Men out on the desert are only allowed to work eight hours. They rest there in the sun until the next day. That makes some of them dissatisfied

and it is very hard to hold the labor, especially out in these exposed places, and in consequence many of our contractors, am sorry to say, have failed; very few make money. We are sorry for that. The result is it is costing more than we had expected, but then I hope that the general prosperity of the country will stand it. The reclamation fund is being expended at the rate of one and one-half millions a month on this work. That money is going into work in the western states and is going to be in circulation largely in your community.

The President in his message has stated very briefly what we have done for four years. You will, I hope, see some of the work in this vicinity. Probably the dam at Minidoka is one of the best examples near here of good permanent construction economically done by good contractors, and I am glad to say at a reasonable profit. But you will see a lot of work which is well done, but which has not yielded the men who have done it one cent of profit. It should be said that the object of the engineers coming at this time has been well stated by our presiding officer, Senator Carter. We come here not to teach you gentlemen. We do not pretend to know what you do in all these details, but we come here to gain that personal acquaintance—the personal friendship, the personal contact, which grows out of meeting men from all parts of the country, men of different ideas, and we want to get the benefit of your experience, the benefit of your criticism, of your judgment, to guide us in the future.

Of course there are questions of policy, many questions of law, which can not be altered by any opinion that we may have, but there are a great many questions of practical management which you can help us in and I hope you will give us your generous sympathy and co-operation. Those questions now are those of management of these works. In the four years that have elapsed there have been settled most of the big questions that annoyed at first—the question of where to carry on the work and how to carry it on and what to do in case of broken contracts, and what to do on this exigency and that. Now we see the work approaching a time where the water is beginning to be turned on the soil and we are face to face with the great question, how shall the men that live upon that soil make payment and what kind of crops shall be raised, and there is the question on which I hope everyone of you will give us some help and suggestion. It goes without saying a good many people in the country—in the East, men of sound business sense, doubt whether this reclamation law is to succeed. They say you can spend money and build the works, but I do not believe those fellows are ever going to pay up. I believe the conditions are such that they will pay all these amounts invested by the government, and the money will be returned to the treasury and used over and over again. The President has said in his letter this morning that that is the crucial test and when this money begins to come back, when the doubting men in the East see it is coming back into the treasury I believe you can get any other necessary money you ask.

One of the questions which has been quite difficult apparently, but which now seems to be satisfactorily solved to a certain degree, has been that of farm units. A good many settlers under the terms of the new law went in and filed on 160 acres, and when the

secretary of the interior, at the advice of the service, cut the farm down to eighty or forty acres, they felt aggrieved. At one time we thought there would be a great deal of trouble, but the cloud has blown over. The men interested have adjusted their farm units, and I now learn that these doubts have been settled, and in the same way I hope that many other questions will when we come to meet them—they will simply solve themselves by the good sense and harmonious action of the people interested.

The subject assigned to me was the "Progress of National Reclamation." That progress has been described in the papers and magazines, and it has seemed to me to be a very old story. Every day when I am in Washington along comes a newspaper man and wants something fresh about the subject. I give it to him, and he sends it out to thousands of readers.

The engineers of the reclamation service will be glad to meet you singly or in delegations, and take up any questions you may ask, and discuss them with you, individually or collectively. I shall be very glad to answer any questions, but I hope that some of these able western lawyers will not ask me legal questions, for I don't know anything about the law.

Owing to lack of space a number of addresses were crowded out of this issue, but they will be published in subsequent issues.

RESOLUTIONS ADOPTED BY THE FOURTEENTH NATIONAL IRRIGATION CONGRESS AT BOISE, IDAHO.

Following are the resolutions recommended by the committee on resolutions of the fourteenth National Irrigation Congress, which closed its session yesterday, as adopted by the congress:

"The congress desires to express its high appreciation of the national irrigation law, and hails with pleasure the opportunities afforded under its beneficent provisions for home-making, and hopes that the several governmental enterprises now under contemplation as well as under construction will be pushed to a speedy and successful completion.

"We heartily approve the efficient and thorough work of the reclamation service in carrying on the work of national reclamation where works have been commenced and are now being executed, and have the fullest confidence in the honesty and ability of that service.

"We recommend that the reclamation service and its representatives co-operate with State officers in matters affecting the States' landed interests.

"This congress indorses and commends the earnest and efficient work of the United States weather bureau of the department of agriculture in establishing a highly useful climatological service in each State which work has proven of great benefit to the irrigation development of the West.

"We heartily commend the excellent work being carried forward by the irrigation and drainage investigations of the office of the experiment stations, United States Department of Agriculture, and recommend the continuance and extension of this work, and urge upon the United States Congress the continuance of the appropriations for this service upon a liberal basis as an essential feature of the thorough development of the arid West.

"Whereas, The building of irrigation works is but a means to an end, since the ultimate success of all irrigation enterprises, whether public or private, depends on the intelligence, skill and industry of those who settle on the lands, and

"Whereas, The organization of farmers' clubs, the holding of farmers' institutes, the establishment of agricultural and industrial high schools, the carrying on of practical experiments for the benefit of the farmer, and the training given by the agricultural colleges and experiment stations are all valuable agencies in the industrial upbuilding of rural communities in irrigated districts;

"We heartily commend and indorse the work of these various agencies, and urge upon the legislatures of all western states and territories the granting of increased appropriations for the purposes.

"We recommend that the president of this congress appoint a committee consisting of five members of this congress, whose duty it shall be to secure the widest publicity of scientific information concerning irrigation, with the view of educating the new settler on irrigated lands in the proper use of water, stimulating the older users of water to a full appreciation of the value of improved methods, and to secure the publication throughout the United States of such information as will serve to inculcate a full recognition of the advantages of irrigated agriculture.

"This committee shall have the power to appoint a secretary at a salary of not to exceed \$25 per month and to incur an expense of not to exceed the sum of \$200 for stamps and incidentals, including stationery, which sums shall be paid as other expenses of this congress are paid, and said committee shall make a full report of its work at the session of this congress for 1907.

"We urge upon the United States government the immediate necessity of solving the various problems now pending in connec-

tion with the operation of the reclamation act, relating to the use of international streams.

"We pledge our earnest support to the United States forest service in its efforts to maintain and improve our water sheds, where irrigation is necessary, on the streams affected, by renewing and protecting the forests upon them. We also indorse the practical policy of forest protection through reasonable use, adopted by the forest service.

"We regard the conservation of ground waters for irrigation as a matter of so much importance as to call for protective legislation.

"We favor the passage of senate bill No. 4624, last session Fifty-ninth congress, as herein amended, said amended bill being as follows:

"That subject to rules and regulations to be prescribed by the secretary of the interior; the owner, in fee simple, or a claimant under any general or special law of the United States, of any land included within the limits of a reservoir site, now or hereafter approved by the secretary of the interior under the provisions of the act of congress entitled, 'An Act to Amend the Timber Culture Laws, and for Other Purposes,' approved March 3, 1891, and acts amendatory thereof, may, at the option of such owner or claimant, relinquish or convey such land, so included in an approved reservoir site, to the United States, and upon the completion of the reservoir so approved, personally select in lieu of the land so relinquished or conveyed an equal area, as nearly as possible, in compact form, of the unappropriated non-timbered public domain of the United States subject to homestead entry, and not withdrawn under the reclamation act, in the same state or territory; and the secretary of the interior shall, by due and appropriate muniments of title, place such owner or claimant in the same relation as to the United States to the title, possession and right of possession of the lien land thus selected as such owner or claimant sustained to the land relinquished at the time the relinquishment was made.

"Section 2. The right of selection as herein provided shall apply to lands relinquished within reservoir sites to be constructed under the reclamation act and in such cases the right of selection may be exercised whenever deemed advisable by the secretary of the interior.

"Believing that too much capital, public and private, can not and will not be invested in the reclamation of arid lands, it is the sense of this congress that government as well as private enterprise should not unnecessarily interfere with nor prevent government enterprises from constructing reservoirs or other works for reclaiming arid lands.

"Whereas, The intelligent conservation of soil moisture will promote an increased duty of water under projects already developed and its extension to additional lands adjacent thereto, and

"Whereas, The same principles will enable successful cultivation by dry farming of immense areas, the tillage of which is now precarious or impracticable;

"Therefore, We heartily indorse the investigations along these lines by the department of agriculture, and recommend the dissemination of information as to better methods of soil agriculture, supplemented by the establishment of experimental stations and model farms in the newly developing districts of the arid and semi-arid regions.

"We recommend the enactment of a federal law providing penalties for unlawful interference with federal headgates and other federal irrigation works.

"Whereas, the eleventh National Irrigation Congress, in September, 1903, inadvertently adopted a resolution indorsing Zea Mays as the national floral emblem,

"Therefore, We rescind said resolution.

"We recommend that the congress of the United States consider the extension of the jurisdiction of the United States courts to provide for the judicial determination of water rights on interstate streams.

"Inasmuch as the sugar beet industry in irrigated America returns to the farmers an annual revenue of over \$20,000,000, and as the production at home of the sugar we now import from the tropics would afford our farmers an additional market for beets amounting to \$100,000,000, and as it has been urged that the United States congress further stimulate the sugar industry of the Philippine islands to produce all or a portion of the sugar we of arid America had hoped to produce,

"Therefore, We protest against any further legislation favoring Philippine sugar, and urge that legislative agitation and attacks upon the sugar production of this country cease, that this great industry of arid America may be fully developed.

"We thoroughly appreciate the interest shown by President Roosevelt in irrigation, as evidenced by his letter to this congress, and extend to him our thanks for his untiring support of national reclamation of the arid and semi-arid lands; and we express our hearty appreciation of the patriotic address of Vice-President Fairbanks, wherein as a broad-minded American he so unqualifiedly indorsed the purposes of this congress, and having in view the best interests of our entire nation so forcibly urged the merit of the reclamation of arid lands.

"We extend thanks to the local press and the press in general for its generous notice and fair consideration.

"Our thanks are tendered to Hon. L. W. Shurtliff, Senator Thomas H. Carter and Governors Chamberlain and Mead for the able and impartial manner in which they have presided over our deliberations. We also extend our thanks to Hon. Montie B. Gwinn, and to the other executive officers for their untiring work and efforts in making this one of the most interesting and instructive sessions in the history of irrigation congresses.

"We extend our hearty and sincere thanks to the people of Idaho, and particularly to the people of Boise, for their splendid welcome, kindly courtesy and marked hospitality, and we shall carry to our respective homes the most pleasant recollections of our visit to this state and its capital city."

NOTES OF THE CONGRESS.

The state of Washington was represented by a strong delegation headed by Governor Mead, E. W. Ross, land commissioner of the state, Judge Cyrus Happy, Spokane; L. W. McLean, Spokane; Walter N.

Granger, Zillah; Henry B. Scudder, North Yakima; E. C. Burlingame, Walla Walla; H. A. Hoover, Hoover; John F. Green, Harrington; D. S. Yarwood, Mohler, and many others. Washington will probably make an effort to secure the sixteenth congress.

The Congress was exceedingly fortunate in securing the attendance of Vice-President Charles Warren Fairbanks, who delivered one of the best speeches of the entire session. The fact of the matter is that the speech of Vice-President Fairbanks was a wonder in its way, as he displayed an accurate knowledge of conditions connected with irrigation affairs, and was withal so hearty and kindly disposed towards his subject and hearers, that he won the hearts of all. It was the general impression of those who heard him that the man who started the report that he is cold and unresponsive, is a maligner of the deepest dye. His entire speech and conduct throughout his stay at Boise was such as to refute any such charges, and should he ever visit the West again, a rousing welcome will be accorded him. We are presenting, on another page, Vice-President Fairbanks' speech.

In the absence of Governor Pardee, Judge Shurtliff took the position of presiding officer and later assigned Senator Carter, Governor Chamberlain and Governor Mead of Washington to the task, all of whom filled the chair creditably and well.

The new president, the Hon. Geo. E. Chamberlain, made a good impression on the delegates and will make a good presiding officer of the fifteenth congress.

Mr. and Mrs. J. H. Kurtz, of Ephrata, Pa., were in attendance as delegates and were much interested in the work of the congress. Mr. Kurtz was a delegate from his state to the Ogden congress.

The Hon. L. Davis, Under Secretary, department of public works, Sydney, N. S. W., was a visitor at the congress and made the acquaintance of many prominent delegates. Mr. Davis stated that a recent congress of irrigationists in his country was about equal in point of attendance to that of Boise, which shows that the people of his far-off country are alive to the importance of this great subject.

The New Mexico delegation, composed of R. E. Twitchell, Las Vegas; W. A. Fleming Jones, Las Cruces; Professors J. D. Tinsley and J. J. Vernon, of the Agricultural College; Dr. F. E. Olney and J. B. Mackell, Las Vegas, made a good fight to secure the fifteenth congress for Las Vegas. These gentlemen made many friends for New Mexico and Las Vegas, and feel that they stand a good show to secure the sixteenth congress for their delightful city.

Nevada was well represented and an effort was made to secure the congress for Reno in 1907. The principal work for Reno was performed by Mr. C. B. Reeves, a hustling lawyer of Ely. Mr. Reeves made many friends for his state among the delegates.

The fourteenth National Irrigation Congress will go down in history as one of the most successful as well as harmonious meetings since its organization. The different interests worked together for the common good and it is clear to those who have made a study of the situation that the disturbing element noticeable in past meetings has been subdued.

One of the large questions brought before the Congress was the settlement of interstate water rights. A resolution to transfer the settlement of water rights

on interstate streams to the federal courts was included in the majority reports of the resolutions committee. It was vigorously opposed by Mr. F. C. Goudy, of Colorado, and supported by Mr. Steel, of Nebraska. The settlement of what promised to be a long argument was reached by the adoption of a substitute resolution introduced by Dr. Elwood Mead, of the United States Department of Agriculture, for the appointment of a committee of five to consider this question and report at the next Congress. This substitute was seconded by Mr. Ashbaugh, one of the attorneys for Kansas. The committee to consider this matter is Dr. Elwood Mead, chairman, of the Department of Agriculture; Morris Bien, of the Reclamation Service; Frank Freeman, of Willows; Col. J. H. Lewis, of Oregon; and Ira P. Englehardt, of Yakima, Wash. Three of the members are lawyers and two are engineers. Mr. Ashbaugh and Mr. Goudy showed in their addresses their familiarity with the subject. Dr. Mead, the chairman, has been connected with the litigation in the Kansas-Colorado case as an engineering expert for the government.

The Hon. St. John Tucker, dean of the George Washington College, Virginia, made a masterful speech to induce the delegates to meet at the Jamestown exposition in 1907. Mr. Tucker is a marvelously persuasive talker and very nearly captured the prize on the first vote, but the later balloting went in favor of Sacramento.

Idaho was loyal to Boise and the Congress, as was evidenced by her delegation of between three and four hundred.

The chairman of the executive committee of the fifteenth congress, Mr. W. A. Beard, of Sacramento, is a man of large experience in the line of handling organizations and he is at present at the head of the Sacramento Valley Improvement and Development Association. Those who are acquainted with Mr. Beard predict a wonderful congress under his management.

SACRAMENTO, CAL., NEXT.

Only two ballots were required to settle the location of the next congress which was fixed at Sacramento. The vote was as follows on first ballot:

Jamestown	111
Sacramento	108
Reno	70
Las Vegas	64

On the next ballot Reno withdrew and the vote stood, Sacramento, 207; Jamestown, 153. The result was received with cheers and the best of feeling prevailed.

The officers chosen by the committee and adopted by the convention were as follows:

President—Hon. George E. Chamberlain, governor of Oregon.

First vice-president—Hon. John Henry Smith, of Utah.

Second vice-president—Hon. H. B. Maxson, of Nevada.

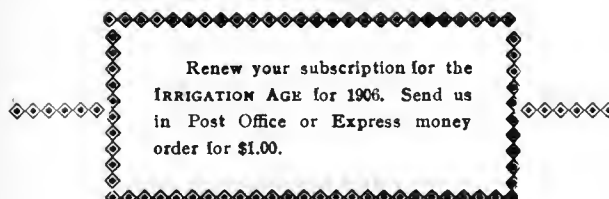
Third vice-president—Hon. George W. Barstow, of Texas.

Secretary—D. H. Anderson, of Illinois.

HONORARY VICE-PRESIDENTS AND MEMBERS OF THE EXECUTIVE COMMITTEE FIFTEENTH N. I. CONGRESS.

State—	Executive Committee.	Hon. Vice-President.
Alabama.....	Eugene A. Smith, University.	J. B. Shivers, Marion.
Arizona.....	B. A. Fowler, Phoenix.....	Dwight R. Heard, Phenix.
Arkansas.....	A. B. Ayers, Little Rock....	Geo. C. Lewis, Little Rock.
California.....	W. A. Beard, Sacramento....	John Fairweather Reedy.
Colorado.....	T. W. Jaycox, Denver.....	F. C. Gowdy, Denver.
Connecticut....	S. C. Durham, Hartford ...	Robert Beardly, Naugatuck.
Delaware.....	Edward Jenkins, Dover.....	Daniel J. Ross, Milford.
District of Columbia...	Elwood Mead, Washington..	C. E. Grunsky, Washington.
Florida.....	J. D. Calhoun, Tampa.....	John H. Stevens, Jacksonville.
Georgia.....	B. M. Hall, Atlanta.....	John Temple Graves, Atlanta.
Idaho.....	R. W. Faris, Twin Falls....	Montie B. Gwinn, Boise.
Illinois.....	James G. Mellaish, Bloomington	A. J. Gahn, Streeter.
Indiana.....	John M. Stanley, Chase....	Henry Warrum, Indianapolis.
Iowa.....	A. R. Swisher, Iowa City..	W. S. Porter, Eldora.
Kansas.....	I. L. Diesem, Garden City..	W. A. Reeder, Logan.
Kentucky.....	R. H. Buckmaster, Lexington.	John McClintock, Lexington.
Louisiana.....	Charles K. Fuqua, Baton Rouge	C. A. Tiebort, Roseland.
Maine.....	Arthur C. Jackson, Bangor	Frederick Robie, Portland.
Maryland.....	C. W. Beck, Baltimore.....	Richard A. Edmonds, Baltimore.
Massachusetts...	Joe Mitchell Chappie, Boston.	Herbert Myrick, Springfield.
Michigan.....	L. D. Linkletter, Ag. Col....	W. A. Smith, Grand Rapids.
Minnesota.....	C. H. Crowley, St. Paul....	James A. Towney, Winona.
Mississippi....	Charles Scott, Rosedale....	T. A. Catchings, Vicksburg.
Missouri.....	I. N. Atterbury, Madison....	W. R. Rice, Harrisonville.
Montana.....	John W. Wade, Helena.....	Thomas N. Carter, Helena.
Nebraska.....	W. R. Akers, Mitchell.....	H. H. Andrews, Galloway.
Nevada.....	John Sparks, Reno.....	George S. Nixon, Winnemucca.
New Hampshire....	E. B. Pike, Pike.....	F. W. Rollins, Concord.
New Jersey.....	John W. Brooke, Trenton....	Fred W. Knichtel, Trenton.
New Mexico....	B. E. Twitchell, Las Vegas..	J. W. Tinsley, Ag. College.
New York.....	T. G. Palmer, New York....	Wilbur F. Wakeman, New York.
North Carolina...	B. D. Heath, Charlotte....	T. W. Wade, Charlotte.
North Dakota....	A. L. Fellows, Bismarck....	E. A. Williams, Bismarck.
Ohio.....	George W. Carey, Lebanon..	F. J. Johnson, New Carlisle.
Oklahoma.....	C. G. Jones, Oklahoma City..	H. S. McGowan, Snyder.
Oregon.....	W. L. Wright, Union.....	Stephen A. Lowell, Pendleton.
Pennsylvania....	T. P. Murphy, Scranton....	J. H. Kurtz, Ephrata.
Rhode Island....	A. J. Utley, Providence....	Oscar Lapham, Providence.
South Carolina...	Robert S. Hartetson, Charleston	C. F. Dill, Greenville.
South Dakota....	Samuel A. Lea, Pierre.....	E. C. Perisho, Vermillion.
Tennessee.....	Irby Bennett, Memphis....	George R. James, Memphis.
Texas.....	Richard E. Burgess, El Paso.....	R. M. Johnston, Houston.
Utah.....	F. J. Kiesel, Ogden.....	Fisber Harris, Salt Lake.
Vermont.....	C. S. Albee, Bellows Falls..	C. J. Bell, St. Johnsbury.
Virginia.....	R. H. Sexton, Norfolk.....	H. St. George Tucker, Lexington.
Washington....	Dr. N. G. Blalock, Walla Walla	Cyrus Happy, Spokane.
West Virginia...	J. C. Brady, Wheeling.....	A. B. White, Charleston.
Wisconsin.....	Sherman Spur, Milwaukee..	A. M. Stondall, Madison.
Wyoming.....	H. C. Howell, Laramie.....	Prof. B. C. Buffum, Laramie.

Delegates may secure photograph of Group by addressing Horace Myers, photographer, Boise, Idaho.



HON. JAMES H. BRADY

Chairman of the Republican State Central Committee, of Idaho, is a native of Pennsylvania, where he was born in 1862. He was raised in the middle West, a portion of the time on a farm. After securing a common school education, he took a two years' course in college. He also took a course in law study, but did not engage in the practice of his profession. After several years spent in teaching school, Mr. Brady became interested in the real estate business, and particularly in western lands and immigration, with which he occupied himself for a number of years. About the time that Idaho secured statehood, Mr. Brady began his business career in that State, although he did not make Idaho his home until about seven years ago, when his interests in irrigation works and power plants had become so extensive as to demand his undivided attention.



Hon. J. H. Brady, Pocatello, Idaho.

Throughout his life Mr. Brady has been an active and uncompromising Republican, and has always taken an interest in party affairs. He was chosen chairman of the Republican State Central Committee at Moscow in the fall of 1904, and during the campaign of that year, which, resulting in the election of the entire Republican State tickets with pluralities ranging from 17,000 to 20,000 he gave indubitable evidence of an aptitude for public affairs and a skill in organization rarely equalled in the Northwest. Mr. Brady was again chosen chairman of the State Central Committee of his party at Pocatello on August 1, 1906. His friends predict for him a career of honor and usefulness in the future.

HON. MONTIE B. GWINN

We are presenting in connection with our report of the Congress, a photo of the chairman of the executive committee, the Hon. Montie B. Gwinn, of Boise. Mr. Gwinn is entitled to a large amount of credit for the manner in which the details for this Congress were worked out, and received many assurances from delegates of the high appreciation of his services. Mr. Gwinn's first experience in the commercial world was gained as a clerk in a frontier store. After some experience in this line, he embarked in business for himself. In 1883 he erected the first building and established the first store in Caldwell. Not a very elaborate institution to be sure. Its dimensions were 16x24 feet, with a dirt floor and a tent warehouse; yet from this is based his success in a commercial way. In 1898 Mr. Gwinn removed to Boise, where, for the succeeding five years he represented the New York Life Insurance Company as state agent. He is the president of the Glens Ferry Bank, vice-president of the Caldwell Banking & Trust Company, and is a directing stockholder in a number of other industrial institutions. He is secretary and manager of the Malheur Livestock Company, which has large holdings of land and sheep in Idaho and Oregon. He recently purchased a large block of stock in the Pendleton Savings Bank, one of the strongest institutions in eastern Oregon, and contemplates removing to that city in the near future. Mr. Gwinn has at times taken an active interest in politics, being recognized as one of the leaders in the councils of the Republican party of the State. Many a hard fought political battle has been won through his experienced generalship. He is recognized as one of the great forces in the up-building of the Pacific Northwest, and will without question be highly honored by the Fifteenth Congress when it meets at Sacramento in 1907.

A NEW PROJECT.

In investigating the Madison river irrigation project, Mont., a scheme to irrigate about 150,000 acres of land located near Helena, a small independent project was developed on the east bank of the Missouri river in the vicinity of Toston and Townsend, and numerous requests have been received by the Reclamation Service from citizens residing in that locality for a report concerning its feasibility.

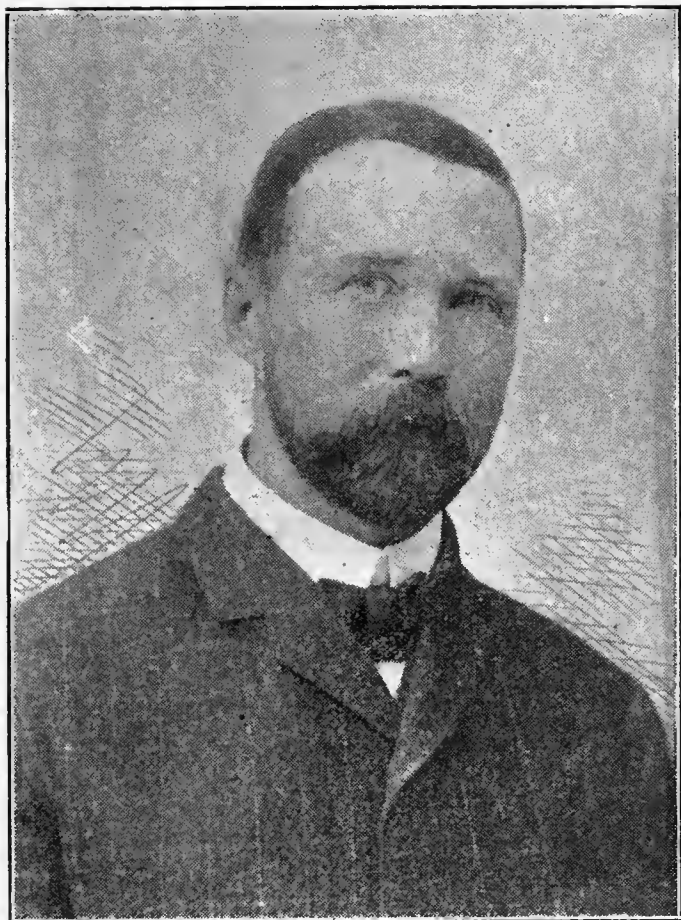
The project would irrigate about 16,800 acres by a canal diverting water from Missouri river on the right bank about three and one-half miles above Toston and running in a general northerly direction for about thirty miles. There are 5,140 acres of cultivated land below the projected canal line location irrigated from Dry, Greyson, Gurnet and Duck creeks and Confederate Gulch. If satisfactory arrangements could be made with the owners of these water rights, their lands could be watered from the canal and the water from the creeks used on lands above the canal, and this area, 5,140 acres, now watered, has been included with the 16,800 acres of irrigable land. There are probably 3,000 acres north of Confederate Gulch that could be irrigated by extending this canal to Avalanche Gulch, but as this would involve many additional miles of canal, it has not been considered.

Most of the land is in private ownership. The crops are principally alfalfa, oats, wheat and rye. As the low water flow of the Missouri river, which occurs in August and September, and sometimes in July, is insufficient, it would be necessary to resort to storage, and it is probable that the reservoir site on Cherry creek or United States Reservoir sites Nos. 25 and 27 could be utilized.

C. B. ADAMS,

Director of Publicity and Promotion.

When the citizens of Boise came to realize what a task confronted them in arranging the details for the Fourteenth National Irrigation Congress, they began to look around for a suitable man to handle the department of Publicity and Promotion, which is, in fact, the most important work done in connection with the Congress. It did not take them long to decide on who was best capable of filling that position, and Mr. C. B. Adams, a well known newspaper man of that city, whose portrait is shown in this issue, was chosen for the position. That no mistake was made in this selection is evidenced by the splendid results of the work of that department. It is safe to say that no one



Mr. C. B. Adams, Director of Publicity, Fourteenth National Irrigation Congress.

man connected with any previous Congress has accomplished so much as has Mr. Adams, and the people of Boise and Idaho, as well as all of the delegates in attendance, are unbounded in their praise, and have repeatedly complimented Mr. Gwinn, the Executive Chairman, on his wise selection. Mr. Adams has been a man of affairs in times past in the great Southwest, and was fully qualified to meet all classes of men with whom it was necessary for him to come in contact in arranging preliminaries and details, shaping up the program, etc., of the Congress just ended. It is hoped that the Sacramento people may see their way clear to secure the services of Mr. Adams, who would no doubt relieve them, in a large measure, of the troublesome details of the Congress.

THE PAYETTE VALLEY, IDAHO.**A Garden Spot of Unusual Attractions.**

A casual visitor, or the man who goes through Idaho by way of the general route, namely, over the Oregon Short Line, can secure but a faint conception of the many interesting features of that state, lying oftentimes close to, and in many instances far distant from that main thoroughfare.

On a recent visit to that state the writer was invited to look over the far famed Payette valley wherein lies the town of Payette; also the well known town of New Plymouth. To the many who are looking about for a chance to better their conditions, Idaho, "The Gem State," offers as many inducements as may be selected in any section of the world. This is a country where the climate is ideal, and where sickness is rare, and the death rate, as stated by statistics, the lowest in the United States. In the far famed Payette valley, which irrigation has converted from a land of aridity into one of the most fertile spots on the face of the earth, may be found many illustrations of what water will accomplish on land so fertile as that which abounds in this section. This valley is especially famous for its fine fruits, its canteloupes, now rank with those of the famous Rocky Ford district in eastern Colorado. As an illustration of the extent of the cantaloupe trade, a representative of the express company informed the writer while at Payette that their receipts on one day's shipments amounted to considerably over \$1,000, and this was exclusive of the carload lots which were sent to remote points and not included with the small ten, twenty and thirty crate consignments. It may readily be seen from the above figures that Payette valley is no mean supporter of the express companies in that section.

The water supply of the Payette valley is one of its strongest and most interesting features; in fact, it is stated that the supply of water in this valley is unfailing, and all farmers in the valley are unusually favored, as they have a bountiful supply and to spare. This fact is evidenced by the manner in which it is used by farmers all along the irrigation ditches.

In this connection, Mr. Herbert Vanderhoof, a well-known newspaper correspondent, publishes the following, which was clipped from a general article written by that gentleman:

"With such an abundant water supply, with a climate so pleasing and beneficial as to reduce the death rate, it must necessarily mean something. It does. In and around the city of Payette, which is located near the lower end of the valley near the Snake river, land has been sold, and is today valued, at from \$100 to \$300 per acre. In other sections of this county are lands, not so well cultivated and in the raw state, which are valued at from \$30 to \$75 per acre.

"To return once more to the climate conditions before considering the subject of farming and horticulture, I want to say that thunderstorms in the Payette valley are practically unknown. That cyclones are an unknown quantity and so are sunstrokes. Practically no winds traverse the valley, and when snow does fall it never measures over twelve inches and then remains not more than three or four days at a time. Canyon county, in which the Payette valley is located, is 2,500 feet above sea level.

LAND A PERFECT BONANZA.

"From a farming standpoint, the Payette valley is the realization of the fond dream of perfection that our farmers and agriculturalists tell us of. The soil is so fertile that the hay crop has become a staple product of the farmer; his alfalfa crops are the envy of the farmers of other states; his clover crop, from which he secures his seed, is rich, so much so that it yields from six to twelve bushels of seed per acre, which sells for \$6 to \$7 per bushel, and this, together with the hay crop he harvests and the excellence of the pasture makes the land a small bonanza for him.

"Cereals of all kinds are grown in abundance in the Payette valley. The corn and wheat grown here contain those gluten and proteids so necessary to life, in great abundance, giving forth besides these things

at the famous Louisiana Purchase exposition in 1904. And finally, when the whole state held a fruit exhibition at Boise City, where every valley and every county was represented, Payette valley came out on top once more, when M. Charles P. Hartley, of Caldwell, took first honors for the best display and best quality of fruits. At the Lewis and Clark exposition last year Idaho alone took eleven first, nineteen second, twenty-one third and five fourth prizes. Of this number of victories Payette valley alone scored twenty-four, winning five gold, nine silver, and eight bronze medals, and two honorable mentions. Her apple orchards surpass those of the famous Mohawk valley, New York, and the Baldwin apple crops of the New England states."

It will be noticed from the foregoing that there are great chances for prospective settlers and home



Fruit Pickers, Payette Valley, Idaho.
Payette Valley Orchard, Eight Years Old.

Corn Field, Payette Valley.
Alfalfa Hay, Payette Valley, Nine Tons per Acre.

immense crops. But while the grazing and farming lands are abundant and fertile, it is the fruit growing industry of the Payette valley that has attracted the attention of the entire country. There is probably no county in any state in the union and no valley, not even excepting those counties and valleys of California so famous for the growing of fruits, that exceed the productivity of Payette valley.

"In 1903, when the irrigation congress met and held an exhibition of fruits at Ogden, Utah, fruit grown in the fertile Payette valley won the beautiful loving cup offered by Senator Clark for the best fruit from all irrigated states. Away back in 1893, at the Columbian exposition at Chicago, the Payette valley fruits took prizes, as they did at Omaha, Paris, France; Buffalo, Lewis and Clark exposition, and the gold medal

seekers in this valley. Some of the prime points are the possibilities of intense farming, which offer unparalleled opportunities for smaller farms, greater profits, nearer neighbors, unusual social advantages, and, as above stated, abundant and never failing water supply at one's very door. On the trip through the valley between Payette and New Plymouth, which was taken with Mr. C. E. Brainard, president of the New Plymouth Land & Colonization Company, much of interest was noted. The distance between Payette and New Plymouth is about fifteen miles, and on all sides are evidences of an unusual richness of soil and the slight amount of labor required to produce large money returns from this land. Mr. Brainard informed the writer that when he first attempted to colonize the section through which we traveled, that land was sell-

ing for from \$15 to \$20 and upward per acre. He stated that for some time it was difficult to convince purchasers of the tremendous producing power of that soil when properly watered, and he cited many instances where men paid the full cost of their land and water right, amounting to \$30 or \$35 per acre, by the first season's crop, and we were shown very many fields of alfalfa and beets, the actual value of whose crop on each acre would more than pay, and, in many instances, double and treble the original cost of the land and water.

To those who understand the possibilities of irrigation this is perhaps not new, but this article is written more with the view of attracting those of our readers who are not familiar with the possibilities of the wedding of land in this valley with water.

particular piece of land has shown an earning capacity which raises it from \$50 an acre land to \$200 an acre or better, and he could no doubt dispose of his farm at that price at this time. There are many more wonderful achievements which might be cited concerning this valley. We mention only an occasional case, so that our readers may have some conception of its possibilities.

This valley is especially notable for the achievements of its farmers along the line of growing alfalfa, which is produced here in such a profusion that the farmer frequently gets from \$30 to \$60 per acre, the latter being the rule, when the hay crop is short in their section of the state. Those of our readers who are desirous of learning more about this famous valley may secure information by addressing Mr. C. E. Brainard, president of the New Plymouth Land and



An Irrigation System in Operation, Payette Valley, Idaho.

Among the many marvelous features of this section may be cited one instance which will attract the attention of irrigators and easterners alike. Only recently has the matter of beet culture been taken up in this valley; in fact, this is the first season that it has been gone into to any extent, and the citizens of the valley expect soon to have a beet sugar factory either in Payette or near there where this product may be worked into sugar nearer at home than the present point, Nampa, to which they must now ship them. The feature referred to is that of a farm between Payette and New Plymouth, where the owner has been particularly successful in his first effort at beet raising. He has made such good headway in this, his first season, that an expert, a banker at Payette, has offered him \$90 per acre for his beet crop. It may readily be seen that with a reasonable acreage in beets a man would not be very long in paying for his farm, which would cost him, water right and all, in the neighborhood of \$50 or \$60 per acre. In point of fact, this

Colonization Company, Payette, Idaho. We are showing in this connection several illustrations of this section.

WILL PUT BLOOM ON A MILLION ACRES.

DENVER, COLO., August 28.—Papers have been filed with the state engineer for the redemption of nearly 1,000,000 acres of arid land, the largest irrigation proposition ever undertaken by private capital. Frank J. McCarthy, a civil engineer, is drafting plans for a reservoir to cover twenty-four square miles, have an average depth of thirty-five feet, and use the entire surplus water of the Platte river. It has been estimated that 38,115,000,000 cubic feet of water was wasted yearly from the Platte river. This proposition is being financed by a syndicate of New York and London bankers. The estimated cost is about \$4,000,000. Work will commence about October 1.

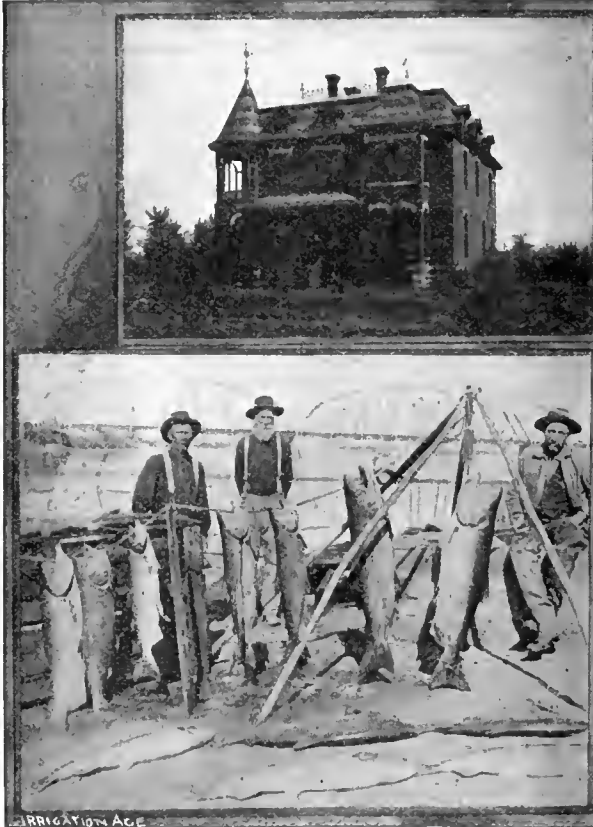
HAILEY, IDAHO, AND WOOD RIVER COUNTRY.

Among the many sections of Idaho interesting alike for their beautiful scenery as well as their agricultural development and possibilities, none perhaps stand out more distinctly as representing a combination of the scenic as well as the agricultural features as that of the Wood River country, adjacent to the beautiful city of Hailey.

Back in 1879 this country was settled, or perhaps it would be better to say discovered, by people interested in mining, from Salt Lake, Utah, among them being Messrs. W. S. McCormick, S. A. Merritt and a man of the name of Lipman, a mining investor and

and on Lost river, not far from this section, sugar beets pay as high as \$100 per acre. Owing to the vast mining operations in the immediate vicinity all local products sell at figures which would be deemed exorbitant elsewhere. Eggs range from 25 to 50 cents a dozen. Butter at from 25 to 40 cents, and chickens from 50 to 75 cents; and hay is frequently sold for as high as \$20 a ton. Settlers in the valley also informed the writer that cattle come off the winter range fit for the block.

Less than one-half of the surveyed land of this vicinity is settled. Various projects are on the way and will soon add half a million acres to the area of cultivated land, and afford thousands opportunities



A Handsome Home, Payette, Idaho.
Fishing Grounds, Payette, Idaho.



A Comfortable Home, Payette Valley.
Home of Manager of Farmers' Canal, Near New Plymouth, Idaho.

merchant of that city. This trio of men started out to prospect in that territory, and after many weeks of wearisome travel they reached what was known as the Rock Creek Station in Cassia county. They subsequently reached the site of Bellevue, and later on what is now known as the Hailey country, and after undergoing many privations and overcoming many difficulties a permanent settlement was established in this section of the valley. Blaine county, in which Hailey is located, is in central Idaho, and extends east and west about 110 miles, and north and south about ninety miles. The soil in this valley is exceedingly fertile and yields about forty bushels of wheat from the sod and fifty to seventy bushels afterward, as well as 100 bushels of oats, while one ranch of the valley holds the record with 115 bushels of oats to the acre. Another ranch, The Drake, near Hailey, has the distinction of having produced 879 bushels of potatoes to the acre. All the fruits of the temperate zone thrive

for homes. Hailey, which is the county seat, is the financial and commercial metropolis of southern and central Idaho. It has a bank of issue, as well as two other banks, two daily and two weekly newspapers, a first-class electric power and light works with arc lights at street intersections, and here is also located the United States land office. At this point is located also a creamery, a cement block factory, and one of the peculiarities of the town is that it has a large hotel which is run by "absent treatment"; in other words, the proprietor or manager is said to handle it from remote points by letter. Another unusual feature to the easterner is that he must pay 50 cents for a hair cut and 25 cents for a shave. Hailey also has a G. A. R. lodge and lodges of the Masonic and Odd Fellows' orders, as well as many auxiliary lodges. It is stated by those who are in a position to know, that 1,000 men can readily secure steady employment in Blaine county or in the country around, of which



Hailey is the metropolis today. There is a need for teamsters and farm or ranch hands and farmers, etc., at good wages. Any industrious laborer, farmer or mechanic in search of a home may go to Hailey or Blaine county, Idaho, without misgivings of his future livelihood. School teachers are also in demand in that section, and the capitalists have the most inviting field in the entire West in central Idaho. They will find paying investments there, as hundreds of prospects of unquestionable value may be selected and worked out to a successful finish at a reasonably small outlay. While in Hailey the writer had the pleasure of driving through the valley south of that town and Bellevue, with Mr. S. D. Boone, a leading capitalist, and Mr. P. F. Horne, cashier of one of the substantial banks of that city. A trip of some thirty miles over the valley was taken and a visit paid to the ranch of

included, among other things, a heaping platter of fine brook trout and a plentiful supply of fried blue grouse, and all of the other good things that are appreciated by a man who has traveled twenty or thirty miles in that bracing atmosphere. The land on this particular sub-irrigated belt will sell readily today for from \$100 to \$200 per acre, and there is no doubt but that with careful cultivation and a better knowledge of the situation from an agricultural point of view, this value will be largely increased. Many small irrigation ditches are taken out of the Wood river and supply water to large areas of fertile lands above and below the town of Hailey.

Hailey is also a great wool market. Large bands of sheep are supported on the hills surrounding it.

In speaking of this section, which is an ideal spot for camping, fishing, etc., with unequalled scenery,



A Typical Wood River Ranch, Idaho.

C. H. Porter, south of Bellevue. Mr. Porter's ranch consists of 160 acres of very valuable land, owing to the fact that it is located on what is known as a sub-irrigation belt, which extends diagonally across the valley; the peculiarity of this belt is that for a width of say one mile and the length equal to the width of the valley, which is about ten miles, a subterranean stream creates what is known as sub-irrigation, so that surface irrigation is wholly unnecessary. The land at this point is exceptionally fertile, and Mr. Porter informs us that his farm pays him \$30 per acre net each year. Reuben G. Price has in all 800 acres on this same belt, and is purchasing other holdings and has unbounded faith in that section. He has recently paid \$16,000 for 560 acres, and has 175 acres of that in grain, which will produce him a splendid income this year. That the farmers live well in this section was demonstrated by a dinner made ready for our party by Mrs. L. Fuller, of the Porter farm, which

Mrs. A. A. Stowe has the following to say concerning it:

"Perhaps none of the places I have noted will appeal to you. It may be that you desire an outing, where real game—big game, I mean—can be found. If so, arrange your party for a months' stay and turn your faces northward from Hailey. Take an early start. The ride to Ketchum in the fresh morning air will prove quite exhilarating. So far, though there has been a gradual rise in the altitude, you have been scarcely conscious of it, but soon after leaving Ketchum you become fully aware that you are 'ascending in the world.' The long summer afternoon will wane and the shades of night will descend upon you ere you make a night's halting place at Galena, if you have been late in starting, or have loitered by the way. But as no team can draw a loaded wagon at a hurried pace up a rapidly ascending grade, you have had time all the afternoon to drink in the kaleidoscopic—magnificent timber, bare, brown rocky faces, too precipitous to hold

either soil or snow, with a high peak showing occasional patches, or even great stretches of glistening snow—all these have been in view. Wild flowers bedeck the roadway as well as the lower terraces of the foothills. Nature is in her happiest mood and you are happy with her."

To any of our readers who are looking for a good opportunity to make a home in a really delightful country we would suggest they write to the secretary of the Commercial club, Hailey, Idaho, for more detailed information. We are presenting in this issue illustrations of points of interest in this section of the state, and also show a very good picture of the town of Hailey, nestled, as she is, between the everlasting hills.



Lower Red Fish Lake and Sawtooth Mountains, near Hailey, Idaho.

ORCHARD COVER-CROPS.

The Nebraska Experiment Station has just issued Bulletin No. 92, entitled "Cover-Crops for Young Orchards." It gives the results of tests conducted at the experiment station during the past seven years, showing the effects of cover-crops on the hardiness of young trees and comparing the value of various crops grown for the protection of orchards against winter injury. Residents of Nebraska may obtain the bulletin without cost by writing to the Agricultural Experiment Station, Lincoln, Neb.



Red Fish Lake and Reflection, Idaho.

MAKE AN INVESTMENT IN BOISE, THE BEAUTIFUL.

Boise, the beautiful Capital of Idaho, is a city with a great future, and one of the safest places for real estate investments in the world.

The population has increased from 9,000 to 20,000 in the past three years. With the great Boise-Payette irrigation scheme trebling the irrigated land at its doors, and the many other irrigation systems building in southern Idaho, it can not fail to double again in

the next five years. This means a tremendous increase in the price of Boise real estate.

We are offering lots in our Londoner, South Boise and Denver additions at prices ranging from \$125 four blocks from car line to \$300 on car line. These lots are being purchased and built on freely by our home people; have increased in value from 25 to 50 per cent in the past year, and we believe they will double in less than five years, probably in three.

The terms on the lots valued at \$175 or less are \$2.50 per month; on those of a higher valuation, \$5.00 per month; 8 per cent interest on deferred payments. You can pay out as fast as you like, and interest ceases on payments as they are made. Why not buy four of these cheaper lots or two of the higher priced ones. It is the greatest savings bank proposition you ever saw.

You will save up \$10.00 a month you would otherwise spend, and when your lots are paid for you will find you have a nice little stake.

If you will write to the Capital State Bank or the Idaho Trust and Savings Bank, we think they will tell you you can trust us to make as good a selection for you as you could make for yourself.

Should be glad to write you further.

W. T. BOOTH,
211 N. Eighth street, Boise, Idaho.



Trout Fishing Is Good in Wood River, Idaho.

The New Mexico College of Agriculture, Mesilla Park, N. M., has issued a press bulletin devoted to grasshoppers. Referring to a new machine being tried at the Experimental station, the bulletin says: "The Hopperdozer, when used freely and continuously, tends to reduce the number of grasshoppers in a field. The hopperdozer is a long, shallow pan of sheet iron, set on two runners and having behind an apron or sail of canvas stretched on an upright frame. When the machine is ready for use place some water in the bottom of the pan, add enough coal oil to form a film over the water, and hitch a horse to one of the outside runners, bring a long rope from the other runner and hitch it to the hame staple of the harness. As the grasshoppers fly, many of them strike the apron behind and fall back into the pan containing kerosene, which is fatal to the insects. As fast as the pan fills up with grasshoppers remove and fill again with water and oil. These hopperdozers are better adapted for use in alfalfa fields, and still better results can be had if they are used before the grasshoppers have formed wings. Very satisfactory results are reported from Colorado of the use of hopperdozer in alfalfa fields."

IRRIGATION IN THE SHOSHONE INDIAN RESERVATION, WYOMING.

There are several sources of large water supply in the ceded portion of the Shoshone Indian Reservation, Wyoming, which will be thrown open for settlement on August 15. What these are and how they may be utilized for the irrigation of extensive areas is told

age of land that is immediately valuable for agriculture.

With a mean average rainfall of about 13 inches a year, the climate is too arid for the raising of crops without irrigation, but a large amount of water in the two principal rivers is available for this use. Along the bottom lands bordering the rivers the water can be taken out in small ditches, though, owing to the spring floods, there will be difficulty in maintaining these ditches and especially their headgates, and the amount



Red Fish Lake, near Hailey.

in a recent report by Mr. N. H. Darton, of the United States Geological Survey, on the geology of the Owl Creek mountains and adjoining region, which has been printed as Senate Document No. 219.

The ceded portion of the Shoshone Indian Reservation is the area lying north of Wind River and east of Popo Agie and Bighorn rivers. It lies in the northern central portion of Fremont county, Wyoming, and includes also a small corner of Bighorn county, ad-

joining Bighorn canyon south of Thermopolis. The total area is about 2,000 square miles. The northern third of this area lies in the Owl Creek and Shoshone mountains and the southern portion comprises a wide region of rolling plains in the Wind River basin. The area is bordered on the south by Wind River and its eastern margin is crossed by Bighorn river. These streams carry a large volume of water and flow in flat-bottomed valleys, along which there is a moderate acre-

age of land that can be irrigated by this means is small. By the construction of irrigation canals, however, wide areas of the basin land could be brought under cultivation, especially if the flood waters of the mountain slopes were stored for use during the dry season. The greater part of the region is well adapted for grazing and this undoubtedly will be its principal use. Fully two-thirds of the land bears a fair growth of nutritious grasses, and water for stock is within reach,



Alturas Lake, near Hailey, Idaho.

age of land that can be irrigated by this means is small. By the construction of irrigation canals, however, wide areas of the basin land could be brought under cultivation, especially if the flood waters of the mountain slopes were stored for use during the dry season. The greater part of the region is well adapted for grazing and this undoubtedly will be its principal use. Fully two-thirds of the land bears a fair growth of nutritious grasses, and water for stock is within reach,

except in a few districts.

The only settlers now in the ceded area are a few Indians and white men who have married squaws. The ranches of these people are widely scattered along the rivers and on the creeks near the foot of the mountains.

Persons desirous of obtaining a copy of this report should make application for it through members of the Senate or House of Representatives.

ROGUE RIVER VALLEY.

The Land of Sunshine and Flowers.

BY JOHN EDWARD BUCK.

MEDFORD, ORE., July 20.—Twenty-five years have elapsed since I last saw this beautiful valley. At that time Jacksonville was the great commercial center of southern Oregon. There was no railroad. Roseburg was the northern terminus, and Redding, Cal., was the southern terminus—a gap of some 350 miles intervening

westward and southeast of Ashland, at a point about three miles north of the state line, a column-like mass of basalt, Pilot Rock, a noted landmark, towers aloft reaching a height of 6,014 feet.

Rogue River Valley is essentially a fruit district, apples and pears grown here having a world-wide reputation.

From Douglas County to the southern State line is found the mean between the heavier rainfall of the Willamette Valley and coast counties, and the dry climate of California to the south. The annual rainfall amounts to from twenty to thirty-five inches, sufficient for all general crops. In some sections irrigation ditches have been constructed, resulting in increased production and profit. Snow occasionally falls during January and February, but does not stay for any length of time. The average range of temperature is from ten degrees above to ninety, the extremes never exceeding zero and 100 degrees, and this for only two or three days at a time.

In all portions of western Oregon the night temperature is always below seventy degrees, being cool and comfortable for sleeping. Sweltering hot nights are therefore unknown.

Although bountiful crops are raised without the aid of artificial irrigation in Rogue River Valley, the output can be vastly increased by this means. The water for irrigation is abundant and is comparatively easy to get upon the land. No extensive works in the way of reservoirs are necessary in most cases. All that is needful is to tap one of the many mountain streams and carry the water through ditches to where it is



Gold Ray Dam, Rogue River and Southern Pacific Track.

which I have traversed by stage. Madam Holt's United States Hotel was the swellest hostelry this side of the Palace Hotel. Dave Crosby was the intrepid marshal of Jacksonville, and the Jacksonville Times, edited by Charles Nickell, was the leading publication outside of Portland and San Francisco.

Now all is changed. Vast areas of sage brush have been transformed into fertile farms, and progressive towns have sprung up where formerly there was only a stage station. Grant's Pass, Medford and Ashland are thriving towns now, while Jacksonville, five miles off the main line, has been neglected.

From a climatic point of view Rogue River Valley is the most inviting portion of Oregon. Here is found the mean between bountiful moisture and excessive dryness. The eastern boundary of the Rogue River Valley is formed by the Cascade Mountains, which extend north and south, and separate the great Klamath Lake basin from the Rogue River country. Approaching the Klamath, the mountains expand into a broad plateau 4,000 to 5,000 feet high, some thirty miles in width. Northward the ground rises and east of Central Point the majestic cone of Mount McLaughlin rises to the height of 9,760 feet. This mountain presents a symmetrical snow-clad cone, piercing the sky far above the neighboring heights. Clothed in snowy white, this mountain is always imposing. Shasta is 100 miles away.

The Siskiyou Range lies along an east and west line and forms the southern border of the country. The three highest points being south of Ashland: Ashland Butte, 7,662 feet; Mount Sterling, 7,337 feet; Mount Wagner, 7,245 feet. This range joins the Cascades near the head of Bear Creek. Along the chain trending



Town of Klamath Falls, Ore.

wanted. The Table Rock Ditch Company, north of Rogue River, has been furnishing water to its stockholders for many years. The people of Eden precinct have an irrigation system of their own—though comparatively small in extent. In the Applegate valley the majority of the farmers have private irrigation ditches, the water being taken from the Applegate River.

The largest and most comprehensive system now in operation in the valley is that of the Fish Lake Water Company. In the year 1900 this enterprise was first definitely commenced and now the company has a ditch line twenty-five miles in length from the intake on the head waters of Little Butte creek to the present end of the ditch on the company's farm, a few miles north-east of Medford. This ditch has a capacity of 5,000 miner's inches and is so constructed that its capacity can be increased at any time, as the demand for water may



Pilot Rock, near Ashland, Ore.

require. The waters of Butte Creek are sufficient during most years—up to the latter part of July at least—to fill the ditch, but in order to be sure of having an ample supply, the company has secured from the Government the right to make a storage reservoir at Fish Lake. This lake lies at the base of Mt. McLaughlin, one of the snow-capped peaks of the Cascades, and is a mile and a half long by a quarter mile wide, varying in depth from four to eight feet. It is fed by a number of ice cold springs, gushing out of McLaughlin's sides and is the source of the north fork of Little Butte. At its outlet the mountains come close together forming a narrow gorge through which Butte Creek rushes on its way to the valley. At this point precipitous bluffs of solid rock face each other and here the Fish Lake Water Company purposes to erect a mighty dam, which will confine the waters of the lake and raise its surface at least thirty feet above its present level. This will give them an immense storage reservoir two miles long by half a mile wide and thirty feet in depth in the shallow parts. The head of the ditch is some twenty miles from the lake, but no more ditch need be built, as when the water begins to run low all that will be necessary is to open the gates at the lake and let the water come down through its natural channel to the point of diversion.

At the present time 50,000 acres of the most pro-

ductive lands in the valley are covered by this ditch, and work is now going on making an extension of nine miles, crossing Bear Creek just north of the city limits of Medford, and which will cover 10,000 acres more of land, much of which is now non-productive, but which under the revivifying effects of water will produce bounteous yields of fruits, grains and vegetables. The Fish Lake Company is the pioneer public irrigation enterprise in the valley and its work has resulted in a great deal more interest being taken in irrigation than ever before.

The Sterling Mining Company, which controls extensive water rights in the Siskiyou, including over twenty-five miles of ditch carrying water to the mines, is considering the matter of using the surplus water in furnishing irrigation for a portion of the valley south and east of Medford. The scheme includes the boring of a tunnel through the divide between the main valley and Sterling, and carrying the water through pipes to the different customers. Already the acreage which the company figured would be necessary in order to make the scheme a feasible and paying one has been subscribed, and more could easily have been secured, only the company wished to be certain as to the amount of water they could furnish before making additional contracts.

The High Line ditch, which starts from Rogue River at Prospect, fifty miles from Medford, and follows the high ridges north of Rogue River to Gold Hill, is another irrigation enterprise upon which work is being done and from which great things are expected. This canal—for a canal it will be in size when completed—is intended to carry water for irrigation and mining purposes, to be used as a means of transporting lumber from the big forests of the upper Rogue River,



On the Willamette River.

and the Umpqua divide, and will cover all that portion of the Rogue River Valley lying north of the river from the head of the ditch to Grants Pass, and has the inexhaustible supply of water from the river to depend upon. Dry gulches, rich in gold, which have not been worked for want of water, will yield up their wealth. Mountain and valley farms that have been unproductive, or at most giving a fair crop, will become consistent producers.

While it is true that some favored portions of the country produce regularly without irrigation, it is nev-

ertheless a fact that irrigation benefits even these. The product is of better quality, more uniform in size, coloring and marketable qualities; especially is this true of fruit; besides the farmer, fruit grower or gardener is always sure of a crop if he can supplement nature's offerings with artificial irrigation.

From one de Anjou pear tree, fully matured in the C. H. Lewis orchard in 1906, thirteen boxes of high grade pears were harvested, which sold for \$5.50 in New York City per box, or \$71.50 less freight, from one tree in a single crop. The great yields of individual trees the past season passed unnoticed in the rush of events.

The foremost enterprise of which Medfordians are justly proud is the Iowa Lumber and Box Company. This company annually manufactures into fruit boxes for the fruit trade of southern Oregon and California fully 7,000,000 feet of pine lumber. It employs upward of 100 men nearly the entire year. This factory also manufactures all kinds of building material.

Medford also has a planing mill, R. W. Gray, pro-

from \$2.50 to \$4 per week.

In the fall of the year girls are able to make from \$1.50 to \$3 per day employed in packing fruit. There is a great demand for girls during the fruit packing season and the greater part of the work is done by them. The fruit packing season begins with peaches and Bartlett pears in August, and later comes the later varieties of pears and following them the apple crop. Usually the season will cover from two to two and a half months.

Attention should be directed to the great diversity of products for which this valley is noted. In the early pioneer days it was found that the valley produced within itself everything necessary for sustaining life in comfort even to the item of salt, although the salt produced at the old Meadows works costs about as much as the gold washed from the gulch placers. Bread, meat, fish, game, fruits of all kinds, wool for clothing, hay for forage, timbers and lumbers for dwellings and construction work of all kinds, iron, copper, the precious metals, only short in the item of fusing coal, to enable



Mount Shasta, as seen from Southern Pacific trains.

prietor, which manufactures building material.

Medford has a flour mill, established in 1887, A. A. Davis, proprietor. It has a daily capacity of eighty barrels.

Medford also has a feed and chop mill, Edward Russ, proprietor.

Medford has a soda water manufacturing plant and bottling works, P. C. Bigham, proprietor.

Medford also has a foundry and machine shops, Trowbridge & Danielson, proprietors; a steam laundry, D. C. Wilson, proprietor; a creamery, Gaddis Brothers, proprietors; a vinegar factory, an ice manufacturing plant; an electric light plant and water pumping station, which the city owns and operates; marble and granite works—two—Hicks and Kershaw and F. W. Wait, proprietors; two brick yards, Childers Bros. and G. W. Priddy, proprietors.

Carpenters are paid from \$2 to \$3.50 per day; masons from \$4 to \$6; lumbermen from \$1.50 to \$2.75; common labor, from \$1.50 to \$2; farm labor, from \$20 to \$30 per month; women or girls for house work,

any occupation to be carried on in the manufacturing line of old methods; and now this deficiency is more than made good by utilizing of nature's forces in the transmission of power over the electric wires.

When one pauses to reflect what this one item in the valley's progress means to future generations, it is almost appalling to speculate upon the changes which it will make in men's ideas of agricultural and manufacturing possibilities. The one matter of irrigating from the water bearing gravel which underlies much of the valley by pumping with electric power will revolutionize fruit culture locally, within the next ten years. In many localities, at a depth of not more than forty feet, an abundance of water can be found for all purposes, and within a decade, Medford will be surrounded with elegant country homes, with land fertile as the Nile, irrigated from pumps belonging to the owner and independent of all corporate and extraneous influences, due to the fact that nature has provided the means, and man of later day proclivities is quick to realize on such possibilities.

THE LA GRANGE DAM OF THE TUOLUMNE.

FRANK J. BRAMHALL, OF THE SOUTHERN PACIFIC SYSTEM.

The scene we present by courtesy of *Sunset Magazine* is one of great picturesque beauty, surpassed, however by its wonderful potentialities of production and resultant home life in the broad valley of the San Joaquin Valley below. Stanislaus county lies on the level floor of the great valley about a hundred miles southeast of San Francisco. For a generation it has been a part of that great domain of wheat so graphically described by Frank Norris in *The Octopus*. Year after year, as far as the eye could see, stretched the imperial fields of wheat—brown in the fall after the gang plows had left it naked to the sun and the seed had been sown—green when the winter rains had sprouted the grain and the warm sunlight of spring had developed its adolescence—amber as it waved in the light breezes and ripened under the warmer rays of early summer—a scene of strenuous activity as the battalions of combined harvesters swept down its serried ranks, threshed and sacked the rich harvest, leaving the great piles of sacked wheat on the field under the cloudless and rainless sky, still and silent as a battle field after the storm of war had passed.

These great ranchers supported but a sparse permanent population, the great bulk of the army of workers being required only during the active campaigns of plowing and harvesting, nomadic and not allied to and of the soil upon which they worked but a small portion of the year. Homes were few and isolated and life on the ranch was in the main lonely and dreary.

Thousands of acres of the great wheat fields were thrown upon the market in smaller tracts and the farmer began to replace the ranchman. But more was needed. Nature gave but three to ten inches of rainfall per annum—enough for wheat raised upon a large scale, but not enough for the diversified agriculture of the farmer—for alfalfa and live stock, for grape vines and fruit trees, for vegetables and vines. Yet here was a great river of sparkling water that poured into the San Joaquin its useless flood only to seek the freedom of the sea through the Golden Gate.

The Tuolumne is one of the most important tributaries of the San Joaquin—one of the largest streams that drains the western slope of the Sierra Nevada. Its sources are in the great snow banks fifty feet or more in thickness that clothe the summits of the great range, ten, twelve, fourteen thousand feet high, not only in winter, but far into the summer season. Its drainage basin is nearly 1,600 square miles—larger than Rhode Island and more than two-thirds the area of Delaware. Its volume varies with the seasons, being greater during the winter and the melting of the mountain snows in the spring and early summer, but ranges from 5,000 to 10,000 cubic feet per second, an amount, properly impounded, sufficient to irrigate two millions of acres.

An irrigation district was formed, bonds issued for \$600,000 at first, and subsequently for \$600,000 more, and the work of development actively entered upon. At the point shown in our illustration the highest overflow dam in the world was well constructed of enormous blocks of blue traprock, weighing from one to six tons, laid in cement, those of the outer face being cut to fit each other. Eighty-four feet thick

at the base, it is 336 feet long and 129 feet high. At the top of this great dam the waters are diverted for irrigation—not all by any means, for a superb cataract pours over it, but the waterways and headgates of the Modesto canal at the north end and the Turlock canal at the south end regulate the flow.

To describe one of these is sufficient, as the other is like unto it. The Turlock canal runs through a rock tunnel 600 feet in length. The waters are then carried through an open canal cut in the solid rock for two miles, and through flumes, cuts, a basin 2,000 feet long made by the miners of former days, and through the bed of a creek for a mile and a quarter to a concrete dam which diverts it from this artificial lake into a canal; and again by flumes, dams, tunnels and earth canals down to the scene of its real labors. It has come eighteen miles, sometimes sixty feet in the air and now enters into some 125 miles of laterals, about two miles apart and running east and west, for distribution over the thirsty fields. The Turlock district contains 176,000 acres, but the canal brings water



La Grange Dam on the Tuolumne, California.

enough to supply double the area.

Instead of a sparse population and a great area of wheat, the big ranches have become small farms, which, under intense cultivation, yields marvelous products. Five and six crops of alfalfa per year make great quantities of beef, mutton, pork, milk and butter. The district is famous for its sweet and Irish potatoes, for its prunes, apricots and grapes. It raises figs, peaches, berries, beans, oranges—what does it not raise? Everything grows and the variety of its products is wonderful to contemplate. This more compact population is prosperous, telephones are more numerous than in many eastern towns, good schools abound, and churches are seen in every community. Best of all its products is the human race of boys and girls, intelligent men and women, happy homes and good society. No finer example could be offered of the beneficent effects of irrigation.

RECLAMATION SERVICE PERSONALS.

Homer Hamlin, of the United States Reclamation Service, and district engineer in charge of the Yuma irrigation project, California and Arizona, has tendered his resignation to the chief engineer and will accept the position of city engineer to Los Angeles, Cal. His resignation will take effect September 1st. Mr. Hamlin was born and educated in Minnesota. He has had wide experience in engineering, having been engaged with the city engineer, San Diego, Cal., in general engineering and surveying in that city, as assistant to the United States engineer in survey for fortifications on Point Loma and Coronado Beach, draftsman in the surveyor's and city engineer's office in Los Angeles, etc. In 1902 he was employed by the United States geological survey in hydrographic and geological investigations, and in 1903 he received an appointment as engineer in the Reclamation Service. Mr. Hamlin's resignation was accepted with much regret by the officials of the service, as the demand for good engineers is greatly in excess of the supply. This is especially true in Government work on account of the low salaries paid by Uncle Sam as compared with those received in private practice.

B. M. Hall, of the Reclamation Service, and supervising engineer for New Mexico, Texas and Oklahoma, who is in Washington for a few days on business connected with his district, reports a most promising state of affairs on the Hondo irrigation project in southeastern New Mexico. All contracts are completed, earth work on the laterals is finished, and nothing now remains undone except some of the small structures in the distributing system, some puddling in the reservoir, etc. This work is being carried on by force account under the supervision of the engineers. The settlers have been receiving the usual low water supply throughout the season, but next spring they will enter into their proper heritage, the reservoir being completed and an ample water supply for all needs assured. Although the land under this project is all in private ownership, Mr. Hall reports that most of the farmers are cutting their farms down to forty acres. This action will insure a dense population, more intensive cultivation, and a consequent increase in the value of the land. The marvelous results of irrigation in this section when sufficient water is applied has been demonstrated in the Roswell district lying just to the east of the Hondo project. Four crops of alfalfa are harvested, while corn, garden truck, cantaloupes, grapes, apples and other fruits produce abundantly. The delicious flavor of irrigated fruits is becoming well known, and the apples which are shipped to Chicago and other eastern markets command a high price. Next year one-tenth of the cost of construction of this project, or \$33,360, will be returned to the reclamation fund to be used again in the construction of other projects.

Information has been received at the Washington office that I. W. Huffaker, of Wheatland, Cal., assistant engineer in the United States Reclamation Service, has been drowned in one of the canals of the Truckee-Carson irrigation project, about five miles west of Fallon, Nevada. While awaiting the arrival of a survey party Mr. Huffaker and one of his assistants decided to go in swimming at a point where the water surface of the canal was about sixty feet and the depth

of water between eight and nine feet. Both of them were poor swimmers and he sank while attempting to swim across the canal. His companion, Mr. Wilbur, was barely able to save himself. Mr. Huffaker has been engaged in general surveying in Montana and in the construction of iron smelters. In 1903 he was appointed engineering aid in the Reclamation Service on Walker River Basin and since the fall of that year has been constantly engaged on the Truckee-Carson project, having had charge of the construction of the Carson River diversion dam and Lake Tahoe outlet regulation works.

Gerard H. Matthes, engineer in the United States Reclamation Service, has been assigned to the Minidoka irrigation project, Idaho, to have charge of maintenance and operation of the canal system which is nearing completion. Mr. Matthes graduated from the Massachusetts Institute of Technology in 1895, and had considerable experience as instrument man and inspector of construction work in Massachusetts. In 1897 he began surveys and measurements of streams in the West in connection with the work of ascertaining the extent to which the arid lands could be reclaimed by irrigation. He was then detailed by the Secretary of the Interior to take charge of construction of water works, sewers, courthouses and schoolhouses in the three towns of Lawton, Anadarko and Hobart, Okla., and built a large number of bridges in the surrounding country. He was then transferred to New Mexico, and has been engaged in various capacities which peculiarly fit him for the position to which he has been assigned.

D. C. Henny, of the United States Reclamation Service, has been designated as supervising engineer for California, excepting that portion of the southern part of the state including the Colorado River and Yuma project, which has been assigned to L. C. Hill, supervising engineer for Arizona, and the Owens Valley under L. H. Taylor, supervising engineer for Nevada. Mr. Henny now has charge practically of the entire Pacific Coast area, including the states of Washington, Oregon and California. This change was brought about by the resignation of J. B. Lippincott, supervising engineer for California and the Klamath irrigation project lying partly in Oregon. Mr. Henny is a graduate of the Government Polytechnic School, Delft, Holland. He was engaged for several years in reclamation work and railroad location in Holland, and has been engaged in railroad construction in Iowa; in waterworks construction in various eastern states; in railroad construction in Colorado; bridge work in Missouri; tunnel construction, New York; and in many other important positions throughout the United States. Both the Reclamation Service and the states to which his services have been assigned are to be congratulated on the possession of one of the finest engineers in the country. His headquarters at present are at Portland, Ore.

Louis C. Hill, of the United States Reclamation Service, has been designated supervising engineer of the southern part of California, including Colorado River and the Yuma project, in addition to his work in Arizona, to fill the place made vacant by the resignation of J. B. Lippincott. Mr. Hill was born in

Michigan and graduated from the state university in 1886. He was engaged constantly in railroad, mining and canal work until 1903, when he received an appointment in the United States Reclamation Service. He has charge of the construction of the Salt River project, which is now in course of construction and is already famous for its wonderful engineering features. Here one of the highest dams in the world is being erected, creating an artificial lake 25 miles long and 200 feet deep against the dam. A cement mill with a capacity of 300 barrels per day is in operation, turning out first-class cement for use in constructing the dam, lining ditches, tunnels, etc. The work also involves a power house, power canal, electric transmission line, etc., and the rebuilding of a considerable part of the distributing system in Salt River Valley. Saw mills have been erected to furnish lumber for the system, and over 100 miles of wagon road were constructed. Sixty miles of this road connects the outside world with the dam site, which is in an almost inaccessible canyon, and is used for hauling supplies to the army of workmen employed there. Engineers who have driven over it pronounce it a marvel of engineering skill, unequalled in this country or in the world. Mr. Hill is regarded as one of the ablest engineers and executives in the country, and although the loss of Mr. Lippincott's services was a severe one, the people of southern California are to be congratulated upon the wise choice of his successor.

RECLAMATION SERVICE NOTES

The Secretary of the Interior is asking for proposals for the construction of main and lateral ditches of the distributing system of the Umatilla irrigation project, Oregon. The work is divided into two nearly equal schedules and includes about 315,000 cubic yards of earth and rock excavation. The bids will be opened at Portland, Ore., October 1st.

The President has issued an order reserving the N. E. $\frac{1}{4}$ of Sec. 24, T. 9, N., R. 5 E., Black Hills Meridian, South Dakota, within the limits of the Belle Fourche irrigation project, for the purpose of experimental work in agriculture, under the supervision of the Department of Agriculture, the tract, however, to remain under the general jurisdiction and control of the Reclamation Service.

Proposals are solicited for furnishing 5,000 barrels of Portland cement for the Garden City irrigation project, Kansas, f. o. b. cars at bidder's mill. The bids will be opened at the office of the Reclamation Service, Garden City, Kas., September 28th.

The Secretary of the Interior has rejected the bid of the Puget Sound Bridge & Dredging Company, of Seattle, Wash., for constructing fourteen miles of main canal, St. Mary irrigation project, Montana. The bid of the above named company, in the sum of \$767,505, was the only one received, and was found to be greatly in excess of the estimates of the engineers of the Reclamation Service.

The Reclamation Service has been authorized to procure such machinery, tools, appliances, equipment and animals as may be necessary in the construction of fourteen miles of the main canal, St. Mary irrigation project, Montana, and to prosecute the work by force account. The Secretary of the Interior recently advertised for proposals for this work, but only one bid was received. That bid was so much in excess of the estimates of the engineers that it was rejected.

The engineers of the United States Reclamation Service have been authorized to continue the construction work on Shoshone dam and on the Corbett tunnel, Shoshone irrigation project, Wyoming, by force account. The contract for the construction of Shoshone dam with Prendergast & Clarkson, of Chicago, Ill., and that for the construction of Corbett tunnel, with Charles Spear, of Billings, Mont., were recently suspended by the Secretary of the Interior by reason of the fact that the contractors were unable to secure the necessary laborers and financial backing to successfully prosecute the work.

A contract has been executed with Newman & Hoy, of St. Paul, Minn., for the construction and completion of the work of Division 3, main canal, Lower Yellowstone irrigation project, Montana and North Dakota. The work called for in the contract consists of about nine miles of canal, involving 1,088,800 cubic yards of excavation, 100,000 cubic yards of overhaul, 900 linear feet of terra cotta pipe, and 2,000 cubic yards of puddling.

The Secretary of the Interior has today withdrawn from any form of disposition whatever under the public land laws, the following described lands in the State of Wyoming, for use in connection with the Jackson Lake reservoir, Minidoka irrigation project, Idaho:

SIXTH PRINCIPAL MERIDIAN.

T. 45 N., R. 114 W., all Secs. 21 to 29 inclusive and 31 to 36 inclusive.

T. 46 N., R. 114 W., all Sec. 25.

T. 44 N., R. 116 W., all Secs. 1, 2, 3, 11 and 12.

T. 45 N., R. 116 W., S $\frac{1}{2}$ Sec. 26, S. $\frac{1}{2}$ Sec. 27, and all Secs. 34, 35 and 36.

A contract has been executed with Hughes & Olson, of Butte, Mont., for the construction and completion of Division 3, main canal and high line canal, Huntley irrigation project, Montana. This work consists of about ten miles of main canal and seven miles of high line canal, and involves the excavation of approximately 350,000 cubic yards of material. According to the terms of the contract, the work is to be completed by May 15, 1907.

A contract has been awarded to the Expanded Metal and Corrugated Bar Company, of St. Louis, Mo., for furnishing 405,000 pounds of steel bars for the reinforcement of concrete, Shoshone irrigation project, Wyoming. The bid of the above named company was \$9,085.50 f. o. b. cars at Minnequa, Colo., or \$7,060.50 f. o. b. cars at Youngstown, Ohio. The contract calls for the delivery of the material f. o. b. cars at Youngstown, Ohio.

Only one bid was received in response to the advertisement of the Secretary of the Interior for proposals for the construction of Divisions 1, 2 and 3 of the main canal, St. Mary irrigation project, Montana. The bid was that of the Puget Sound Bridge and Dredging Company, of Seattle, Wash., amounting to \$767,505. This company was recently awarded contract for the construction of the storage feed canal, Umatilla irrigation project, Oregon.

An agreement has been executed on behalf of the United States by J. T. Whistler, with the Wilson Irrigation Company, of Umatilla county, Ore., whereby the latter agrees to permit the Reclamation Service to cross their right of way and canal with feed canal, ditches, roads, telephone and electric transmission lines, and other irrigation works under the Umatilla irrigation project, Oregon. According to the terms of the agreement, the Wilson Irrigation Company grants this right of way in consideration of the payment of one dollar and upon condition that the works made necessary by said crossing be perpetually maintained by the United States.

The United States Reclamation Service has been authorized to organize a force to carry on the work of repairing and maintaining the Interstate canal, North Platte irrigation project, Wyoming and Nebraska. This authority carries with it an appropriation of \$12,000 for the purchase of horses, tools, etc. In addition to repairs on account of erosions, wash-outs, etc., the work will consist of putting in small drains, inlets to take small amounts of surface water into the canal, paving around outlets, and other work which would necessitate a multitude of small contracts, causing delays and increasing the cost.

A contract has been awarded to the Illinois Steel Company, of Chicago, Ill., for furnishing 40,000 barrels of Portland cement for use in construction work in connection with the North Platte irrigation project, Nebraska, and the Shoshone irrigation project, Wyoming. The cement will be furnished for \$1.40 per barrel, f. o. b. cars at the mill of the contracting company, South Chicago, Ill. All deliveries of cement under this contract are to be completed before February 1, 1907, the maximum amount required in any one month not exceeding 10,000 barrels, and sixty days' notice will be given for the delivery requirements.

The engineer in charge of work on the Gunnison tunnel, Uncompahgre irrigation project, Colorado, reports that 718 feet were excavated during July, making the total amount of tunnel excavated to date, 14,614 linear feet. Less headway was made in July than in previous months on account of the friable material encountered in heading No. 2, the acci-

dent by a premature explosion in heading No. 1, and the quantity of water flowing in at the latter heading. This work is being watched with a great deal of interest by engineers throughout the country by reason of the fact that it is the longest and largest underground waterway of its kind in the world. Its total length will be 30,000 feet, its cross section, $10\frac{1}{2}$ by $11\frac{1}{2}$ feet, and its capacity, 13,000 cubic feet per second. It is to be cement lined throughout and completed in 1908 at an approximate cost of \$2,000,000. For the greater part of its length the tunnel is in solid granite, in some places 2,000 feet below the surface of Vernal Mesa. This tunnel will carry water from Gunnison canyon over into the valley of the Uncompahgre river, where it will be used to irrigate about 150,000 acres of fine agricultural land.

Authority has been granted to the Reclamation Service to construct a temporary dam at the outlet of Jackson Lake, Wyoming. The reservoir thus created will be used in connection with the Minidoka irrigation project, Idaho. It is probable that in 1907 from 8,000 to 16,000 acres of land under this project will be ready for irrigation, and the plans of the project contemplate that the normal flow of Snake river shall be augmented by the water stored on the headwaters in Jackson Lake. It is proposed to erect a temporary dam from 10 to 15 feet high by which sufficient water can be impounded to irrigate practically all the land that can arrange to receive it during the next six to eight years, and this structure will serve as a coffer dam when permanent works are built. The estimated cost of the dam is \$30,000.

There was a surprised lot of farmers in the neighborhood of Malaga, New Mexico, a short time ago, when the Reclamation Service engineers turned the water into the Black river canal, under the Carlsbad project. The work on this project has been pushed rapidly in order to serve as large an acreage as possible during the season. The Black river canal was completed in May, including about 4,000 feet of concrete lining, and a full head of water is now being delivered to the farms in the vicinity of Malaga. The work was finished in double-quick time and the farmers got the water before they expected it and a larger quantity than they counted upon. Consequently they did not prepare and plant all the land that could have been cultivated. The old ditch leaked out three-fourths of the water it diverted, but this fault is not found in the new canal. The Black river ditch diverts directly from Black river, a tributary entering the right bank of the Pecos river, about eighteen miles below Carlsbad. The earth work on the first three miles of the main canal of the Carlsbad project is practically completed and another force is busy tearing out the old spillway at Dark canyon, removing the present bank and making excavation for the 7-foot concrete pipe, and building new embankments. The large storehouse at Avalon dam has been completed and the stone crusher is in place and nearly ready for operation. The bridge has been repaired and excavation has been begun for the core wall of the dam at the east end near the canal heading. Tools and machinery are arriving every day and the force is being enlarged and organized for rapid and effective work.

A report has been received at the office of the Reclamation Service from the supervising engineer of the North Platte irrigation project, Wyoming and Nebraska, stating that the Pathfinder dam site is practically uncovered and shows an excellent foundation. Very little excavation is now required to prepare the bed rock for the masonry. The erection of this dam will be watched with a great deal of interest all over the country. It will be one of the largest dams in the world, being 210 feet high and 130 feet long on top, and costing \$1,000,000. The storage capacity of the reservoir will be 43,560,000,000 cubic feet, or more than ten times that of the great Croton reservoir in New York. Water in excess of all demands has been flowing in the first forty-five miles of the great Interstate canal. Work is being pushed on land surveys under laterals and on the classification and subdivision of land. Small parties under force account are busily engaged on maintenance work, erecting small structures, etc., contractors are taking advantage of the fair weather, and the whole valley presents a scene of activity that gives promise of early agricultural prosperity.

The Secretary of the Interior has approved the contract entered into by John E. Field on behalf of the United States Government, and the Platte Valley Telephone Company, of Scottsbluff, Neb., whereby the above named company agrees to furnish telephone service in connection with the North Platte irrigation project, Nebraska and Wyoming. It was found necessary to establish telephone connections between the headgates of the Interstate canal, located at Whalen, Wyo.,

and the various headquarters, camps and stations of the Reclamation Service, in order to expedite the work of constructing the irrigation system. Eleven stations will be installed at the various camps and the company will place additional wires on the poles of its lines now in operation or to be constructed between Whalen, Wyo., and Camp No. 8 in Nebraska, and construct and maintain such new lines as may be necessary to connect the telephone stations with each other and with the various exchanges in the district lying between Guernsey, Wyo., and Bridgeport, Neb. Long distance service may also be had with the Pathfinder dam site located above Alcova, Wyo. According to the terms of the contract, unlimited service will be furnished over the lines of the company until July 1, 1909, for the sum of \$110 per month; and additional instruments will be installed and paid for at the rate of \$3.00 per month, if desired. The business of the United States Reclamation Service shall take precedence over the lines when possible, but not to the extent of interfering with the use of its toll lines for toll business; but between the hours of 8 and 9 p. m., of each day, the business of the Reclamation Service shall have right of way over all lines.

DELAY IN WORK.

At noon, on August 9th, the Secretary of the Interior took possession of the work and contractor's outfit on the Corbett tunnel on northern Wyoming. This contract was awarded to Charles Spear, cashier of the Billings State bank. He in turn made arrangements for carrying on the work under the Western Construction Company. The difficulties of securing labor and the high cost of material resulted in such delays to the work that it apparently became impossible to finance the operations, and on August 3d the Western Construction Company was unable to pay the 400 or more men then employed. It will be necessary to carry on the work by force account under the Government engineers until some further arrangements can be made. The bids on Corbett tunnel were opened September 6, 1905, and awarded to Charles Spear on an estimated basis of \$594,325. The next lowest bid was made by J. G. White & Co., of New York, at \$599,750.

About the same time the Government officers took possession of the work and outfit of Prendegast & Clarkson on the Shoshone dam, one of the largest structures in the West. This firm also has not been able to secure necessary men and financial backing to carry them through the many discouragements incident to construction on a large river. The bids for this work were opened September 5, 1905, and award made on an estimated basis of \$515,730. The next lowest bid was that of J. G. White & Co., of New York, at \$558,855.

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PROBABLE IRRIGABLE LANDS.

In response to requests from the residents of Carbon county, Mont., the United States Reclamation Service recently made a reconnaissance of the elevations and approximate areas of irrigable lands on the east side of Clarke Fork, near the Montana-Wyoming State line. It has long been the belief of settlers in that locality that large bodies of land are so situated as to be irrigable from Clarke Fork.

It was found that a tract of land, known as Chapman Bench, lies along Pat O'Hara Creek for a distance of twelve miles. This bench has an average width of one and one-half miles and contains approximately 12,000 acres of good land which lies well for distributing water. Owing to its high elevation above Clarke Fork canyon, however, and the long, rough country through which the canal would run, any scheme for irrigating the land from the waters of Clarke Fork is not

considered feasible. There is no other tract of land from the lower end of this bench north to Chance, Mont., with the exception of a few small scattering areas not worth considering.

Along the stream bed of Big Sand Coulee there are several small areas of land from one to several hundred acres in extent that lie low enough to be watered from the Fork, but these could all be readily handled by private capital. One tract of 3,000 acres in extent, well up on the stream and at an elevation of approximately 4,400 feet above sea level, probably could be watered very economically by diverting water from the proposed high line canal of the Shoshone project. There is about 6,000 acres of good land on the Sand Coulee drainage. All the remaining land in the vicinity of Big Sand Coulee and to the east of the Chapman Bench is of sand dunes and bad land breaks. The tract of land known as Big Mesa is in the Shoshone drainage and is properly a part of that project. It is too high for irrigation from Clarke Fork without a dam several hundred feet in height and tunnels aggregating several miles in length.

CONTRACTS AWARDED.

The Secretary of the Interior has today awarded contracts for the construction of earth works of distributing system, Interstate canal, North Platte irrigation project, Wyoming and Nebraska, as follows:

Schedule 1, consisting of earth work on about seventeen miles of laterals, J. W. McNeel, of Morrill, Neb., \$22,890.

Schedule 2, earth work on about eleven miles of laterals, Deadwood Construction Company, of Deadwood, S. D., \$8,175.

Schedule 3, earth work on about fifteen miles of laterals, Jerry Hurley, of Pratt, Neb., \$6,830.

Schedule 4, earth work on about ten miles of laterals, Flower & Twing, Morrill, Neb., \$11,711.

Schedule 5, earth work on fourteen miles of laterals, Maney Bros & Co., of Oklahoma City, Okla., \$12,390.

Schedule 6, earth work on about seven miles of laterals, Hobbs, McElroy & McElroy, Morrill, Neb., \$9,407.

Schedules 7 and 8, about seventeen miles of earth work on laterals, James O'Connor, Mitchell, Neb., \$20,237.

Schedule 9, earth work on twelve miles of laterals, D. R. Noe, Morrill, Neb., \$6,922.50.

Schedules 10 and 11, earth work on ten miles of laterals, Marcus E. Getter, of Mitchell, Neb., \$5,649.

Schedule 12, earth work on six miles of laterals, to Frank Wynegar, of Mitchell, Neb., \$3,300.

Schedule 13, earth work on about eight miles of laterals, Pickering & Rush, Morrill, Neb., \$6,052.50.

Schedule 14, earth work on about three miles of laterals, C. E. Cheesman, of Mitchell, Neb., \$2,031.

Bids were previously received for this work and opened on June 15th, when it was found that the lowest proposal received was 65 per cent higher than the engineers' estimate of cost. The bids were therefore rejected and the present informal bids solicited.

UNCLE SAM IN THE ROLE OF PEACEMAKER.

Uncle Sam as a peacemaker is by no means a new role, but he has recently extended his operations, not, however, to foreign countries, but to internal difficulties where conditions have been such that neither the states nor individuals have been able to accomplish effective results.

The most striking recent incident is in the Yakima valley, in the central part of the State of Washington. This is a dry region in which irrigation is successfully practiced from the waters of streams issuing from the Cascade mountains and forming the Yakima river. The demand for water has gradually exceeded the supply, and throughout the entire length of this valley, or rather series of valleys, there have arisen interminable controversies and law suits, and bitter feelings.

Instead of cultivating the fields the farmers were watching their headgates or using dynamite to destroy their neighbors' controlling works, and the earnings from the fields were going into the hands of the lawyers rather than into the purchase of new machinery or household goods. Each irrigator was possessed with the idea that someone was stealing his water and the first impulse was to fight personally or in the courts for possession.

Appalled at the outlook the majority of the farmers finally concluded to importune the Secretary of the Interior to help them out through the facilities offered by the reclamation act. After careful investigation this was done, and the principal canal, the key to the whole situation, was purchased for a quarter of a million dollars. This enabled the government, as an owner and appropriator of water, to step in and bring together the conflicting interests. The controversies have suddenly ceased and the farmers, even though they may not obtain all that they wish, have settled down in the belief that the government officials are trying to treat them fairly and are distributing the water with justice. As a result the crops of the present year are unusually good, notwithstanding the low water stage in the stream. Incidentally the profits to the government will be large and will tend to extinguish in part the investment already made.

The success attained in the Yakima valley is leading other communities long vexed with litigation to ask the Secretary of the Interior to step in and impartially administer the equitable distribution of the water. The engineers of the reclamation service have won a reputation for being fair with the irrigators, without local bias or prejudice, and their measurements have been accepted without question.

The estimated cost of the project without storage is \$254,000. On a basis of 16,800 acres, this gives a cost per acre of \$15.12; adding \$5 per acre for maintenance and operation for ten years, gives a cost of practically \$20 per acre without storage. Sufficient data is not at hand to warrant an estimate on the cost of storage, which must be known before it is possible to decide upon the feasibility of the project.

The Secretary of the Interior has approved an agreement executed on behalf of the United States by J. T. Whistler with the Wilson Irrigation Company, of Umatilla county, Oregon, whereby the latter agrees to permit the Reclamation Service to cross their right of way and canal with feed canal, ditches, roads, telephone and electric transmission lines, and other irrigation works under the Umatilla irrigation project, Oregon.

According to the terms of the agreement the Wilson Irrigation Company grants this right of way in consideration of the payment of one dollar and upon condition that the works made necessary by said crossing be perpetually maintained by the United States.

"Newspapers Worth Counting" is the name of a unique book to be issued shortly by the Printers' Ink Publishing Company of New York. The forthcoming publication is edited by George P. Rowell, who, thirty-eight years ago, established the American Newspaper Directory, and under whose auspices and control it has ever since made its annual appearance. It is the national authority on newspaper statistics, and a study of its pages reveals the interesting facts that only one newspaper in three succeeds in gaining a sale of so many as a thousand copies; and of those that do, only one in five will allow the advertising public to know how many copies they issue. It is a circumstance that affords some satisfaction to this paper that "Newspapers Worth Counting" will record it not only among the one of three, but also among the one of five as well. The forthcoming book (500 pages octavo) is one that will greatly interest every man who has to do with advertising. It will be sold for \$1.00 a copy. Subscriptions will be received at this office.

FOR SALE

160 acre water right on irrigation project near Denver, Colorado.

Write

HENRY MEISSNER, LEIGHTON, IOWA.

NO MORE BLIND HORSES For Specific Ophthalmia, Moon Blindness, and other sore eyes, BARRY CO., Iowa City, Ia., have a sure cure.

THE CAPITAL STATE BANK OF IDAHO.

One of Idaho's Leading Institutions—Its Courtesy to Congress Delegates and Visitors.

BY W. C. JENKINS.

"Pluck wins! It always wins, tho' days be slow,
And nights be dark twixt days that come and go,
Still pluck will win. Its average is sure,
He gains the prize who can the most endure,
Who faces issues—he who never shirks,
Who waits and watches and who always works."

During the annual session of the National Irrigation Congress at Boise, Idaho, the delegates were all given a personal invitation to visit the Capital State Bank of Idaho, the largest banking institution in the State. This invitation was a neatly printed affair and



Mr. George D. Ellis, President the Capital State Bank of Idaho.
Boise, Idaho

contained the personal signature of Mr. H. E. Neal, cashier of the bank. A courteous representative of the bank handed each delegate the invitation and a great deal of interest was manifested in the kindly spirit shown by this prosperous financial institution.

The successful careers of some institutions are immensely inspiring. The simple presentation, without any attempt at ornament, fixes the attention, arouses the interest, and instills a lesson which is never forgotten. The history of some financial institutions remains an enduring monument to human energy; it is a legacy to the world, more to be prized than mere wealth, and nowhere can be found a more striking example of the effects of confidence in expectation than in the history of the Capital State Bank of Idaho.

Organized at a time when the country was on the threshold of a financial panic, establishing itself in a community where competition was of the keenest character, and yet, withal, forging its way into public confidence and esteem until today it stands in the front rank of the great banking institutions of the West.

Such is the history in brief of the Capital State Bank of Idaho.

On November 9, 1892, the Capital State Bank opened its doors and asked for recognition. It started

with a capital of \$50,000. This capital remained the same until 1902, when it was increased to \$100,000, and during the present year the capital has been again increased to \$200,000, paid up, and the bank enjoys a surplus of \$90,000. Its deposits at the present time are \$1,290,000. To illustrate the remarkable gains made by this bank since its organization the following statement of the growth in deposits may be given:

January 1, 1900.....	\$ 401,697.57
January 1, 1901.....	479,093.81
January 1, 1902.....	604,831.59
January 1, 1903.....	187,015.69
January 1, 1904.....	817,437.20
January 1, 1905.....	923,582.81
January 1, 1906.....	1,029,231.94
August 15, 1906.....	1,289,609.18

The officers and directors are as follows:

George D. Ellis, president.

Joseph C. Pence, vice-president.

Orlando F. Bacon, vice-president.

Horace E. Neal, cashier.

Fay D. Young, assistant cashier.

John W. Eagleson, assistant cashier.

W. Scott Neal, Walter C. Cleveland, Robert F. Cooke, Arthur J. Swain, directors.

The bank has a savings department in connection.

George D. Ellis, president of the Capital State Bank, is one of the pioneers of Idaho. He came to Boise in February, 1863, when he formed a partnership with Thomas Davis. These gentlemen built the first irrigation ditch in the Boise Valley. The early settlers selected the lowlands where irrigation ditches could be constructed with comparatively small expense. In those days the bench sage brush lands were considered absolutely valueless. As years rolled on, however, the



Mr. Horace E. Neal, Cashier the Capital State Bank of Idaho.
Boise, Idaho.

efforts put forth to reclaim these lands were followed by wonderful success, and in the work of transforming a desert of sage brush into a beautiful garden spot there was no more enthusiastic worker than George D. Ellis. Time, in its kindly manner, has demonstrated that the confidence which Mr. Ellis maintained in the future and which confidence he inspired in the minds of others was not of a mistaken character.

When Mr. Ellis purchased a hundred and sixty acres of sage brush land in 1865 and began the work of

reclaiming it from the desert, many persons scoffed at the idea. It was the first attempt to reclaim the sage brush lands in Idaho. The irrigating ditches and laterals were perhaps not model feats in engineering, but they did the work and irrigation of sage brush lands was pronounced a success.

Mr. Ellis spent twenty-five years on the farm. During this time he was also engaged in the freight business. In early days freight was transported several hundred miles on pack horses; later, wagons were used, and in this vocation Mr. Ellis spent his early days in Idaho. When the Capital State Bank was organized in 1891 Mr. Ellis was one of the leading business men who became identified with the movement. In 1893 he was elected president of the bank, an office he has held since that time.

The successful business career of H. E. Neal, cashier of the Capital State Bank of Idaho, is a striking example of the results of industry and honesty. There are few young men who have come to the Western States whose success has been more pronounced, and it would be difficult to find the management of a large banking institution more competent and yet more courteous and considerate of the needs of men who are engaged in business and who are compelled to reply upon the accommodations extended by bankers at various times. Mr. Neal was born in Iowa and spent his boyhood days on the farm. He graduated from the State Normal School of Nebraska in 1883, and later attended Tabor College, Iowa, and later the Wesleyan University of Nebraska. His first business experience was in eastern Colorado, where he was engaged in the lumber and real estate business; he also served two years as county treasurer. In 1891 Mr. Neal moved to Boise and with his brother, W. Scott Neal, conducted a farm loan business until the following year, when the Capital State Bank was organized and he was given the position of assistant cashier. On February 2, 1894, Mr. Neal was elected cashier, and this position he has held since that date. In addition to his banking interests, Mr. Neal is identified in a financial way with the Fairview addition to the city of Boise, a tract of land valued at \$250,000. He is one of the directors and treasurer of the Utah Long Distance Telephone Company. He is also a large owner in the Ashland Manufacturing Company in Southern Oregon. In addition to his many business interests, Mr. Neal finds time to improve the educational system of Boise, and he has been for some time one of the trustees of the Independent School Districts of Boise. This is conceded to be one of the finest school organizations in the West.

Among the other energetic and popular young men who are actively engaged in bringing the Capital State Bank to the front rank among the Western financial institutions may be mentioned Fay D. Young and John W. Eagleson, both assistant cashiers. Joseph C. Pence and O. F. Bacon, first and second vice-presidents, respectively, are extensive sheep dealers. The officers and directors of the bank enjoy the full confidence of the people of Idaho.

OPPORTUNITY.

They do me wrong who say I come no more
When once I knock and fail to find you in;
For every day I stand outside your door,
And bid you wake and rise to fight and win.

Wail not for precious chances passed away,
Weep not for golden ages on the wane!
Each night I burn the records of the day;
At sunrise every soul is born again.

Laugh like a boy at splendors that have sped,
To vanished joys be blind and deaf and dumb;
My judgments seal the dead past with its dead,
But never bind a moment yet to come.



Hon. Fred J. Kiesel, a Prominent Delegate from Ogden, Utah.

Though deep in mire, wring not your hands and weep;
I lend my arm to all who say, "I can!"
No shamefaced outcast ever sank so deep
But yet might rise and be again a man!

Dost thou behold thy lost youth all aghast?
Dost reel from righteous retribution's blow?
Then turn from blotted archives of the past
And find the future's pages white as snow.

Art thou a mourner? Rouse thee from thy spell;
Art thou a sinner? Sins may be forgiven;
Each morning gives thee wings to flee from hell,
Each night a star to guide thy feet to heaven!

—Walter Malone.

Send \$2.50 for The Irrigation Age
1 year, and the Primer of Irrigation

AN INTERESTING SIDE ATTRACTION TO THE IRRIGATION CONGRESS.

Horse Exhibit by the Palo Alto Stock Farm.

BY W. C. JENKINS.

A little incident took place during the annual session of the Irrigation Congress at Boise, which was not down on the program, but which was a surprise and also a revelation to the two thousand visitors who were in the city. This feature was the horse exhibit, made by the Palo Alto Stock Farm of Boise, on the main streets of the city. Preceded by the Columbia band, twenty-one stallions of the finest blood in the world followed each other along the street. It was a parade such as had never been witnessed by any of the delegates and many complimentary remarks were made regarding this unexpected treat for the delegates to the Irrigation Congress.

stallion, having glossy jet black ears, mane and tail, that was the able leader of a great drove of exceptionally fine wild horses. This particular equine organization was reported to have been seen many times, and, according to these reports, it ranged over all the vast empire bounded by the Missouri River, the Rocky Mountains, northern Montana and southern Texas. Repeated attempts were said to have been made to capture the large and beautiful leader of this active band, but without success.

It is not necessary to dwell upon the fictional element of these old stories. The horses found in the West until recent years were neither large nor beautiful, and it was only when such business corporations as the Palo Alto Stock Farm people and other individuals came to the West that the horses were worthy of any special notice.

There is no business organization in the United States that has contributed more toward the improvement of the Western horse than the Palo Alto Stock



Splendid Exhibit of Pure Bred Belgian, Percheron and French Coach Stallions by the Palo Alto Stock Farm, Boise, Idaho.

Mr. N. H. Thompson, manager of the Palo Alto Stock Farm at Boise, is deserving of much credit from the farmers of the West. To the old settlers who compared these magnificent specimens of the horse with the original free horses of the plains the sight was very inspiring. It is only a few years since the small wiry animals used in the West have given way to the blooded stock, which has been prominent in Europe and the East for many years. A mistaken notion regarding the horses of the West prevailed for many years. Between fifty and seventy years ago it was very generally believed by the people of the East that upon the great plains of the West there were multitudes of beautiful wild horses. Certain books and many tales of travelers that purported to deal with life and adventure on the plains, and which contained grossly exaggerated accounts of droves of these animals were responsible for these popular errors. In some instances the stories in the books were supported by absurd pictures, in the foreground of which large and high spirited horses were the conspicuous objects. One very interesting narrative, and which was given wide circulation, told of a large white

Farm of Boise, Idaho. This firm has also a large farm and stables at Emmetsburg, Iowa. Mr. N. H. Thompson is manager of the Western farm and stables. This firm is recognized throughout the country as importers and breeders of Percheron, Belgian and French Coach stallions. From twenty-five to a hundred head of these blooded animals are constantly kept on hand. The Percheron and Belgian horses are the most popular draft horses in the West, while among driving horses the French Coach seems to be given the preference. Some of the stallions imported by the Palo Alto Stock Farm have sold for as high as \$6,000 each.

The unprecedented success of this company is due to the excellent quality of their stock, combined with careful conservative management, just and liberal treatment of their customers and the perfect fulfillment of every obligation. Stallions from the stables of the Palo Alto Stock Farm have won prizes as follows:

First prize, Minnesota State Fair, 1905; first prize at the American Royal, 1905; first prize winners at the Great Annual Show of France, 1905; first prize win-

ners of French Coach horses at the Minnesota and Iowa State Fair.

All the company's horses were approved by the governments of France and Belgium. It is the motto of the Palo Alto Stock Farm that the best is none too good for the American farmer. As the result of this firm establishing itself in the Western States, it can be safely stated that the value of horses has greatly increased; many instances have been recorded where this increased value is at least 200 per cent.

This institution is much admired and appreciated by the people of Idaho and other adjoining States and is receiving the most liberal patronage.

A letter addressed to Mr. N. H. Thompson, manager, Boise, Idaho, will bring any information desired regarding these blooded stallions.

MEETING OF THE AMERICAN IRRIGATION FEDERATION AT BOISE, IDAHO.

Owing to the tardy arrival of members, the meeting of the American Irrigation Federation, called to meet at Boise September 2d, was deferred until Wednesday, September 5th. In the absence of President L. Bradford Prince, the meeting was called to order by Executive Chairman G. L. Shumway. Judge Cyrus Happy, of Spokane, was named temporary chairman, and Pressley E. Horn, of Hailey, secretary.

The original declaration of principles was adopted without amendment. The original officers were re-elected without change, except that of C. G. Rowley, of Jackson, Mich., retired from membership of the executive committee. C. E. Brainerd, of Payette, Idaho, and J. Turley, of Blanco, N. M., were named new members of the executive committee, and Prof. J. D. Tinsley of New Mexico, and Pressley E. Horn of Hailey, Idaho, were named vice-presidents. The officers now are:

President, L. Bradford Prince, Santa Fe, N. M.

Secretary, D. H. Anderson, Chicago.

Executive Committee: G. L. Shumway, Scottsbluff, Neb., chairman; John McAlpine, Duluth, Minn.; Zera Snow, Portland, Ore.; C. M. Heinze, Los Angeles; ex-Governor Frank Hunt, Boise; Lucius W. Wilcox, Denver; C. E. Brainerd, Payette, Idaho; J. Turley, Blanco, N. M.

Vice-Presidents: Pressley E. Horne, Hailey; Prof. J. D. Tinsley, Mesilla Park, N. M.; Tom Richardson, Portland, Ore.; Judge Cyrus Happy, Spokane; A. H. Heber, Los Angeles; Clarence T. Johnson, Cheyenne; Prof. O. V. P. Stout, Lincoln, Neb.; L. M. Wilcox, Denver; C. D. Reppy, Florence, Ariz.; Prof. F. D. Coburn, Topeka, Kas.; William Hale Thompson, Chicago; John McAlpine, Duluth; A. J. Cobban, Rhineland, Wis.; John Hall, Lampassos Springs, Tex.

The federation extended cordial greetings to the National Irrigation Congress and pledged itself to encourage and assist the fifteenth congress as it has labored for the success of the fourteenth, and formally volunteered its services to the reclamation department in consulting, advisory or arbitration capacity and invited the United States Geological Survey to command its services in any question recited in the declaration of purposes.

Plans for promotion of the federation by organizing clubs at various places to discuss all phases and subjects of irrigation interest were approved. These clubs are to receive bulletins regularly, containing latest

irrigation news, and in return are to report to the Chicago office any new or interesting question or development which is to be sent in regular periods to all branches. The following declaration of principles was adopted:

DECLARATION OF PRINCIPLES.

First—To endeavor to harmonize conflicting interests.

Second—To counsel with federal authorities and private enterprises relative to determining their respective priorities and privileges.

Third—To promote essential legislation, propose laws to encourage irrigation development and to perfect those already on the statutes.

Fourth—To circulate instructive irrigation literature and exploit best methods of irrigation farming.

Fifth—To aid in the settlement of the newly reclaimed areas.

Sixth—To accomplish as quickly as possible the reclamation of the greatest available acreage and people it with the most desirable and progressive citizenship possible to obtain.

Seventh—To fearlessly criticize the reclamation officials or private promoters, should they offend our sense of justice.

Eighth—To aid in adjustment of freight rates to and from the new areas and to recommend the establishment of mills and factories where needed.

Ninth—To accomplish by criticism and suggestion increased efficiency and perfection of the national irrigation act.

Tenth—To invite friendly discussion and earnest co-operation in efforts to perfect the reclamation service and prevent errors and waste that must eventually be borne by water users.

Eleventh—To preserve the right of the pioneers of irrigation against unjust aggression and confiscation.

A NEW PROJECT.

SPOKANE, WASH., August 27.—Twenty thousand acres of land between the eastern city limits of Spokane and the Washington-Idaho line will be brought under irrigation by means of a system of canals to be constructed by D. C. Corbin, of Spokane, at a cost of \$200,000. Between 15,000 and 20,000 acres of land will be watered, and it is purposed to cut the land up into 10-acre tracts for market gardening. In outlining his plan Mr. Corbin said:

"The water will come from the Spokane river, above Post Falls, Idaho, where I have just secured water rights from the state of Idaho, and in addition to this I have an agreement with the Washington Water Power Company of Spokane for from 50 to 250 cubic feet of water per second.

"Work on the canals will begin the coming fall. The Spokane Land and Water Company has authorized \$500,000 in 10-year 6 per cent gold bonds, and \$200,000 of this amount will be used in irrigating the valley, the main canal from the river being 25 feet wide and from six to eight feet in depth."

Mr. Corbin, who has associated with him his son, Austin Corbin 2d, announces also that the Washington State Sugar Company, of which he is the president, will enlarge its sugar plant at Waverly, Wash., and will buy all the sugar beets that can be raised in the Spokane valley. The plant is now operating 50 days a year, turning out between 50,000 and 60,000 bags of sugar. It is intended to operate 120 days, making an output of from 150,000 to 200,000 bags.

Our readers are requested to send us in the address of friends to whom you wish sample copies of Irrigation Age mailed.

MINUTES OF THE MEETING OF THE CO-OPERATIVE EXPERIMENT ASSOCIATION OF THE GREAT PLAINS AREA, HELD AT LINCOLN, NEB., JUNE 21 AND 22, 1906.

The meeting was called to order at 2 o'clock p. m. in the Agricultural building of the Nebraska State University, by the secretary. There were present at the meeting the following members: Texas, A. H. Leidigh, of the Amarillo station; Kansas, Professor Nicholls, president of the Kansas Agricultural College, Prof. A. M. Ten Eyck, agriculturist, Prof. J. T. Willard, director of the Kansas Experiment station, O. H. Elling, superintendent of the Hays' sub-station; Nebraska, Prof. E. A. Burnett, director of the Nebraska Experiment station, Prof. T. L. Lyon, agriculturist and associate director, Dr. Charles E. Bessey, dean of the school of agriculture, University of Nebraska, Prof. W. P. Snyder, superintendent of the North Platte sub-station, E. G. Montgomery, agriculturist, Alvin Keyser, assistant chemist, State Experiment station, W. W. Burr, special agent, Department of Agriculture, stationed at North Platte; South Dakota, Prof. W. A. Wheeler, superintendent of the Highmore sub-station, John S. Cole, agriculturist of the South Dakota Experiment station; North Dakota, Prof. J. H. Shepperd, agriculturist of the North Dakota Experiment station, Mrs. J. H. Shepperd, of Fargo, N. D., and O. A. Thompson, superintendent of the Edgeley sub-station; Bureau of Plant Industry, Department of Agriculture, Dr. L. J. Briggs, physicist, Dr. Karl F. Kellerman, soil bacteriologist, T. H. Kearney, of the Plant Breeding Laboratory, C. S. Scofield, agriculturist in charge of Western Agricultural extension, Dr. J. A. Le Clerc, of the Bureau of Chemistry, E. C. Chilcott, of Dry Land Agriculture, L. A. Fitz, Cereal Investigations, J. B. Rorer, of Plant Pathology, C. J. Brandt, plant physiologist, C. Quinn and J. A. Warren, of the Office of Farm Management. There were a considerable of agricultural students and residents of Lincoln and vicinity in attendance, whose names were not obtained. Among those whose names were obtained were the following: W. H. Borr, L. L. Zook, C. E. Temple, F. J. Allway, C. F. Davis, Fort Collins, Colo., and E. H. Wilke.

President B. T. Galloway not being present at the meeting, Prof. E. A. Burnett was elected president pro tem by unanimous vote. An address of welcome was given by Dean Charles E. Bessey, of the Nebraska State University, which was responded to by Prof. J. H. Shepperd, of the North Dakota Agricultural College. In the absence of President Galloway, no president's address was delivered, but the secretary read the minutes of the previous meeting, held at Washington, D. C., which minutes were adopted by the association. The secretary also made a brief statement concerning the development and condition of the co-operative work in the Great Plains Area. An address by Prof. J. H. Shepperd, of North Dakota, upon the subject of "The Effect of Crop Rotation on Soil Fertility," was listened to with great interest, and brought out some very interesting discussions. The next paper was by Prof. John S. Cole, of South Dakota, upon the subject, "The Comparative Value of Corn and Summer Fallow in Alternation with Wheat." Mr. Cole gave some very striking results of experiments that had been carried on at the Brookings and Highmore stations, the net results of which seem to indicate that a crop of corn in the rotation leaves the land in as good condition for the following crop of wheat as does the summer fallow. In the animated discussion which followed, it developed that many other experimenters had had similar results. The meeting adjourned to meet in the parlor of the Lincoln hotel, which had been kindly tendered for that purpose by the hotel management.

AFTERNOON SESSION, JUNE 21, 1906.

The meeting was called to order by Prof. E. A. Burnett, with practically the same attendance as at the former session. Mr. A. H. Leidigh, superintendent of the Amarillo station, Texas, read a very interesting paper upon "Drought Resistance of Sorghum Crops," which brought out a lively discussion and developed the fact that there is great need of breeding and selection of sorghums for drought resistance. This paper was followed by one on "Drought Resistant Crops," by Prof. A. M. Ten Eyck, of the Kansas Experiment station. This paper brought out a very lively discussion considering the methods of field selections of grains, Mr. Ten Eyck favoring the method of bulk selection, while the majority of the other speakers favored the selection from individual plants. Many

interesting facts were brought in this connection, the discussion being carried on until a very late hour, when the meeting adjourned to meet at the Agricultural building of the State University.

MORNING SESSION, JUNE 22, 1906.

The members of the association met at the Experiment station at 9 o'clock a. m. and spent two hours in driving over the Experiment station grounds in carriages furnished by the Experiment station. This furnished an excellent opportunity for the visiting members to see something of the very extensive and thorough work in agricultural experimentation being carried on by the Nebraska Experiment station. At 11 o'clock the meeting was called to order by Prof. E. A. Burnett, with about the same attendance as at previous meetings. The time and place of the next meeting was taken up as the first order of business, and it was moved, seconded and carried that the next meeting should be at the Agricultural College of Kansas, Manhattan, Kas., in June, the exact date to be determined upon by the executive committee. The election of officers was then taken up, with the result that Prof. E. A. Burnett was elected president of the association for the ensuing year; Prof. J. T. Willard, first vice-president; Prof. J. H. Shepperd, second vice-president; and E. C. Chilcott, secretary. The following executive committee was then elected: Professor Nicholls, A. M. Ten Eyck and E. C. Chilcott. Prof. T. L. Lyon then delivered a very interesting address upon the results of experiments which he had made upon the effect of the change of seed from one locality to another. Professor Lyon exhibited several interesting tables which he had prepared, showing the effect of change of seed. The net results of his experiments showed very conclusively the desirability of using carefully selected home grown seed in preference to seed brought from any other locality. This brought out a very interesting discussion, and while there were a few dissenting voices, a very large majority of those present agreed with Professor Lyon's conclusion. Very few had ever carried on as conclusive experiments as had Professor Lyon. At 12 o'clock the meeting adjourned to attend a luncheon tendered by the Lincoln Commercial Club at their clubrooms, where the association was very hospitably entertained.

AFTERNOON SESSION, JUNE 22, 1906.

The association met at 2 p. m. at the Agricultural building, with about the same attendance of the previous meetings. Professor Burnett called Professor Nicholls to the chair and he presided during the afternoon session. The first paper was to have been given by Prof. W. A. Olin, of Colorado. A letter was read from Professor Olin, stating that the sickness of his wife prevented his attendance, but that he was heartily in sympathy with the work of the association and regretted his failure to attend. He also enclosed a paper upon "Seed Selection Essential in Crop Production Under Semiarid Conditions," which paper was read by the secretary. Dr. L. J. Briggs, physicist of the Bureau of Plant Industry, then delivered a very interesting address upon, "Proposed Physical Investigation in Connection with the Co-operative Cultivation Experiments," in which he pointed out the close relation between cultivation methods and physical determination and described some of the methods he proposed to adopt in the field. Dr. Briggs was kept busy answering the numerous questions that were asked concerning the work, which he succeeded in doing in a very satisfactory manner. The large number of questions asked showed that there was a very active interest in the physical investigations. Prof. O. H. Elling then delivered an address upon the subject of "Crop Production in Western Kansas," which showed that Mr. Elling was thoroughly acquainted with not only what was being done upon the Fort Hays sub-station, but also by farmers in that vicinity. Mr. Elling's paper gave rise to the comparison of conditions and problems at the several sub-stations, which showed that many of these sub-stations have practically the same problems to deal with, and it is believed that the discussion will result in the adoption of similar methods in the attempted solution of these problems. Mr. L. A. Fitz then delivered an address upon "Some Methods and Varieties for the Winter Wheat District," which was listened to with marked interest, and would have been discussed at greater length had not the hour of adjournment arrived. A paper by Prof. L. R. Waldron, superintendent of the Dickinson station, was read by title, "Some Relations of Abnormal Seasons to the Co-operative Experiments," but the program was so full that it was not possible to read the paper at length.

Do You Like Apples?

DO YOU WANT TO RAISE

BIG, RED APPLES

Peaches, Prunes, Melons, or Make
Hay when the Sun Shines?

BUY LAND IN THE PAYETTE VALLEY IDAHO

A good investment to be growing along with the boys and turned over to them later.

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- 3d. At the time you secure your water right you will make, through us, your application to the State of Idaho for the land.

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The price of perpetual water rights ranges from \$15 to \$25 per share according to quality and location of land.

One share of water will irrigate one acre of land. The amount furnished each year is sufficient, if placed upon the land at one time, to cover it 30 inches deep. The water is measured at the point where it is delivered to the purchaser, thereby saving him all loss from seepage or evaporation. The average rainfall in Idaho is 13 inches each year.

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Out in the great western irrigation section of the United States, where hundreds of thousands of acres of land are being reclaimed and cultivated, there has always been more or less difficulty and disappointment experienced in securing the necessary financial assistance to carry through these projects, due partially to the lack of knowledge of irrigation in general, and the fact that it was a hard matter to secure attention to them.

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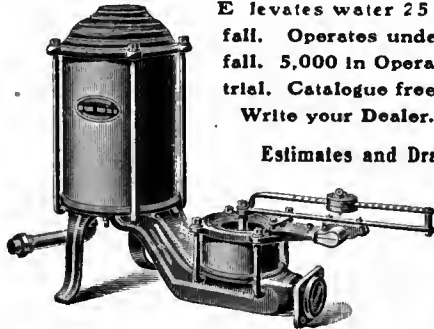
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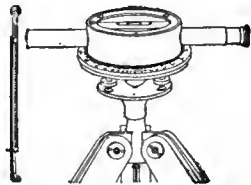
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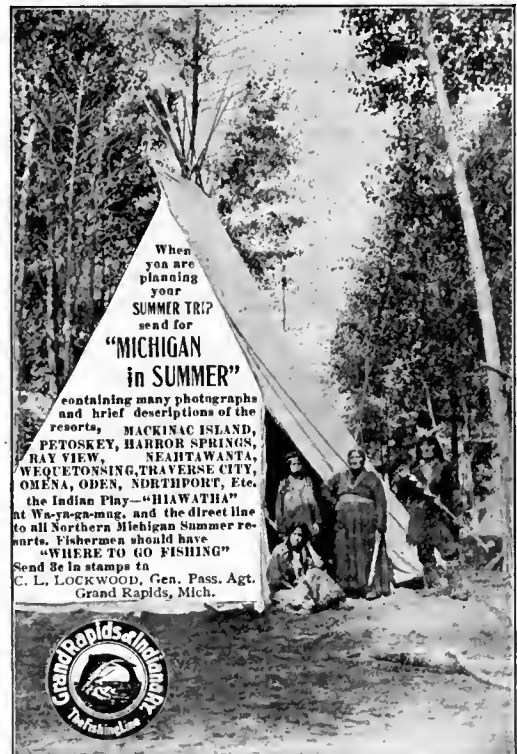
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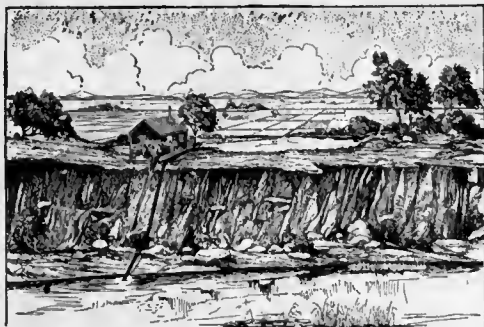
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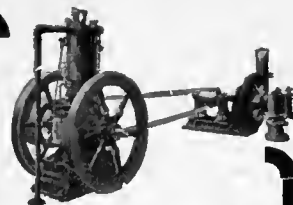
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Are Especially Adapted For Use in the Arid and Semi-Arid Regions.



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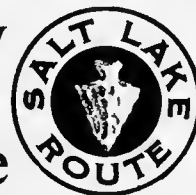
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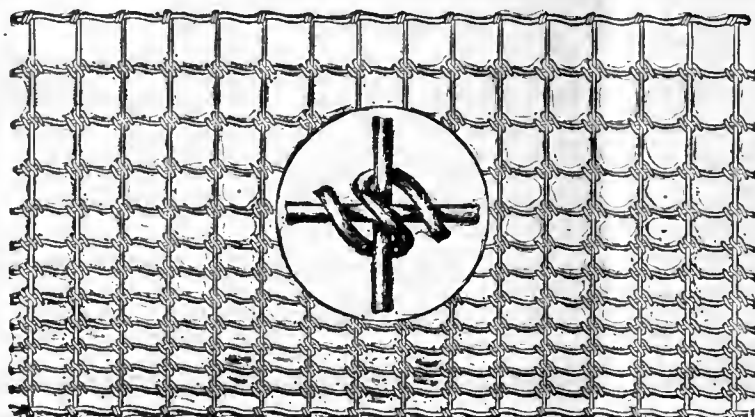
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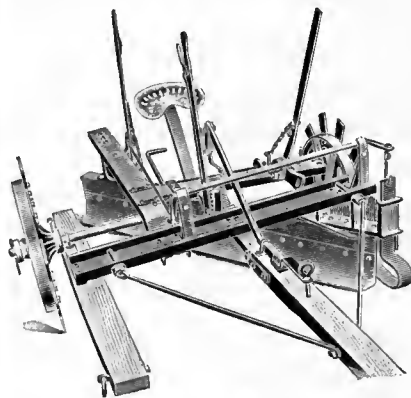
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I manufacture the Climax and Chief Pullers also, intended for lighter work.

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Send for catalog of the machine you are interested in.

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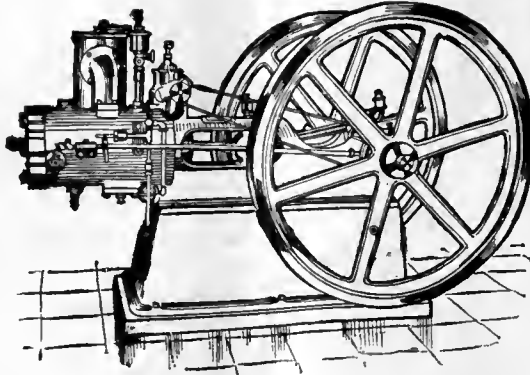
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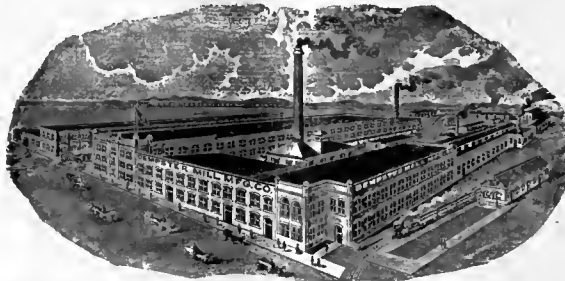
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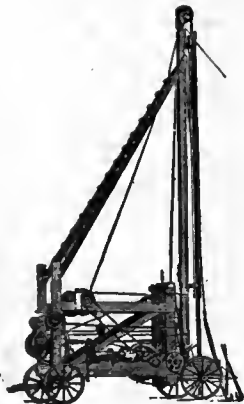
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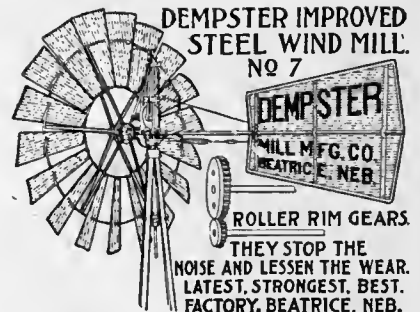
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VOL. XXI.

CHICAGO, OCTOBER, 1906

No. 12.



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The waste banks are built at a distance from the ditch, may be made continuous to serve as dykes and increase the capacity of the ditch.

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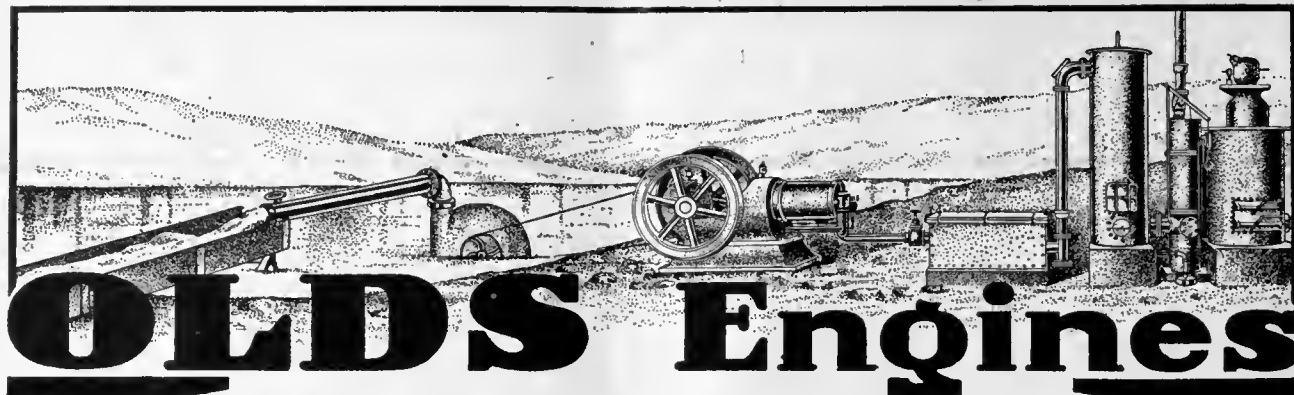
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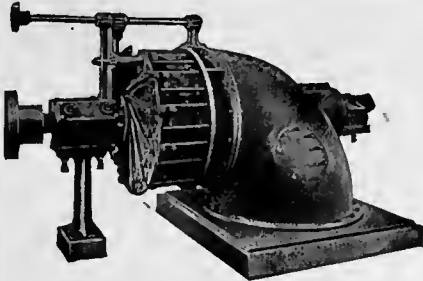
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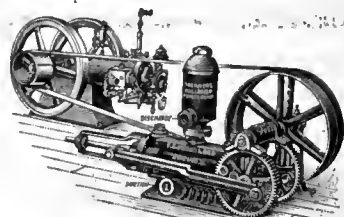


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STANDARD OF THE WORLD

MYERS POWER PUMPS

WITHOUT AN EQUAL ON THE GLOBE



OPERATING
WITH
GAS ENGINE

FIG. 952

HORIZONTAL BULLDOZERS, 3" to 6" CYLINDERS

MYERS
BACK GEARED
WORKING HEAD

TAPPED FOR
3" PIPE

5, 7½ and 10"
STROKE

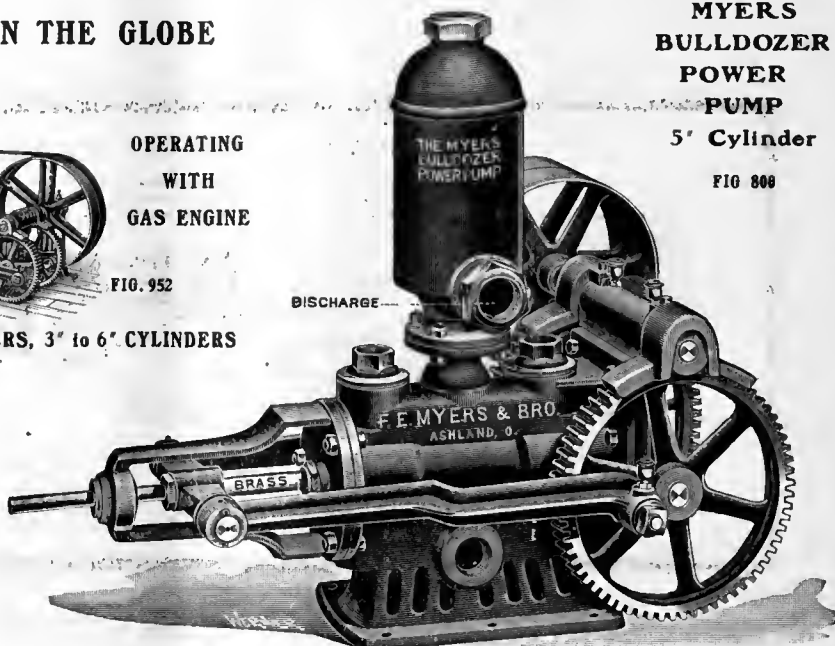
FOR
BELT, WIND OR
HAND POWER

FIG. 1113

2½" DISCHARGE



Write or Descriptive Circulars and Prices
We want you to acknowledge this Ad. so
that we can acquaint you in detail with the
superior features of Myers Power
Pumps. This is the proper season.
The right time to write is right now.

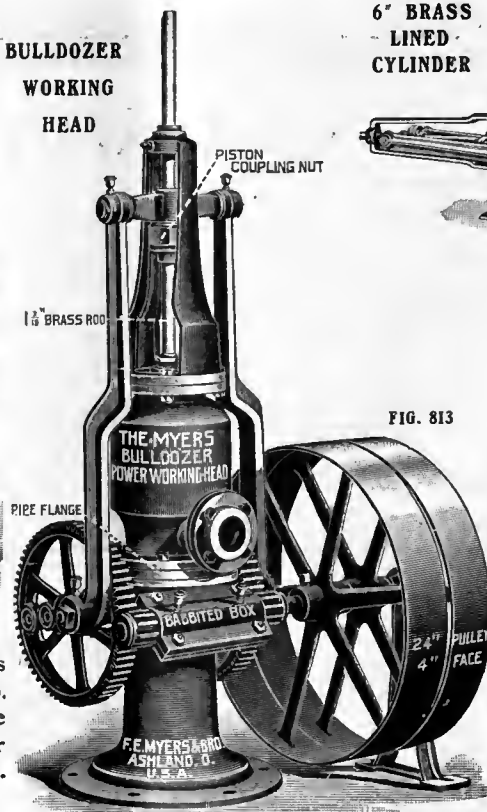


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PUMP

5" Cylinder

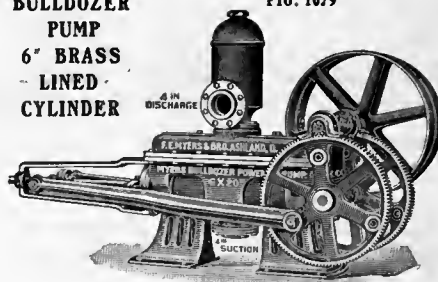
FIG. 808

BULLDOZER
WORKING
HEAD



BULLDOZER
PUMP
6" BRASS
LINED
CYLINDER

FIG. 1079



MYERS BULLDOZER
WORKING HEADS

No. 359

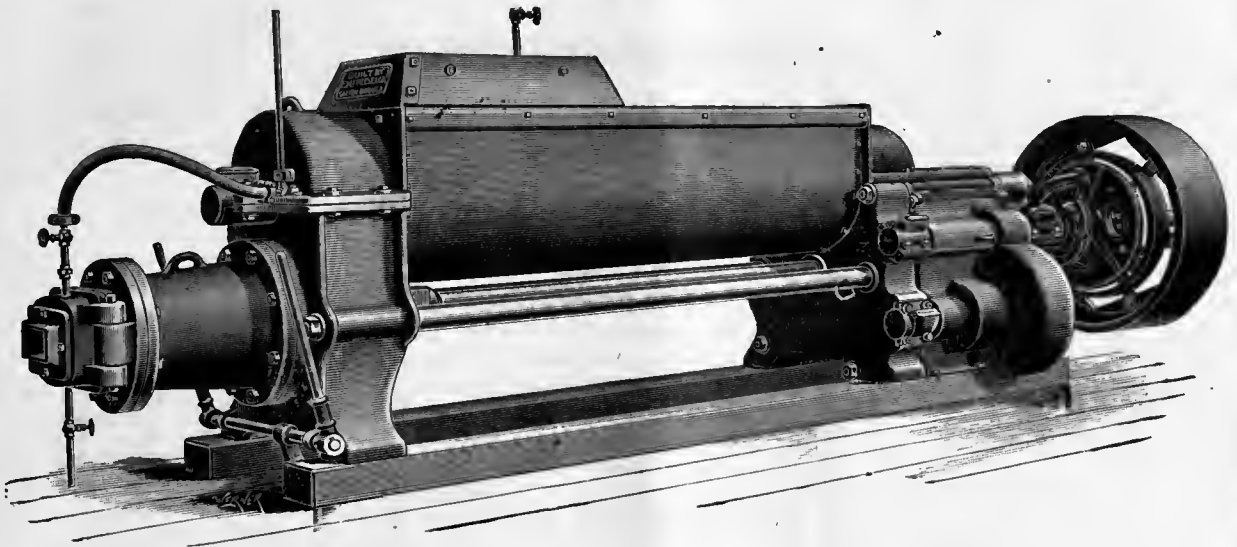
5", 7½", 10" STROKE
DISCHARGE, 2½ or 3 INCHES
SUCTION 2 to 4 INCHES

No. 364

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REGULARLY FITTED 4" DIS-
CHARGE
SUCTION 8' OR LESS

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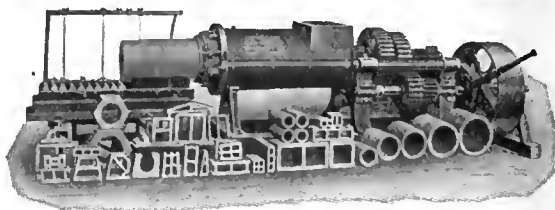


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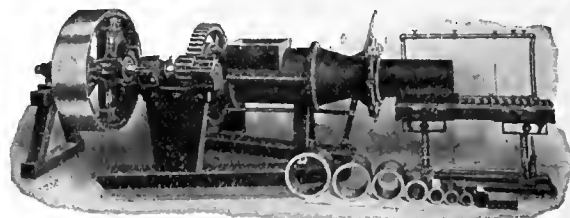
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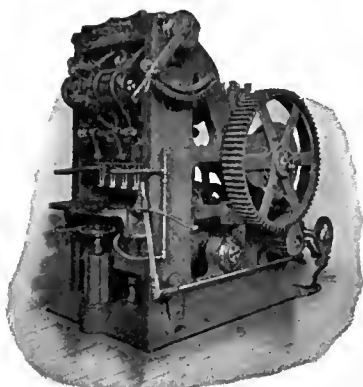
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Centennial Auger Machine



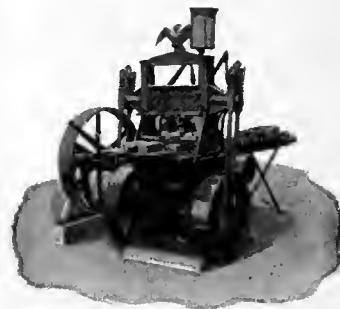
Auger Machine



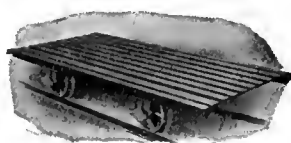
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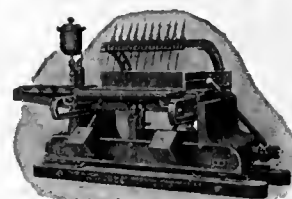
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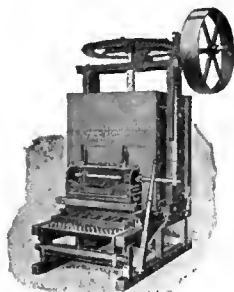
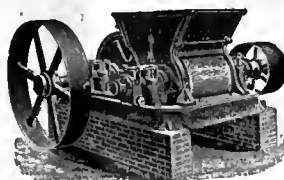
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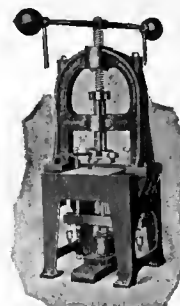
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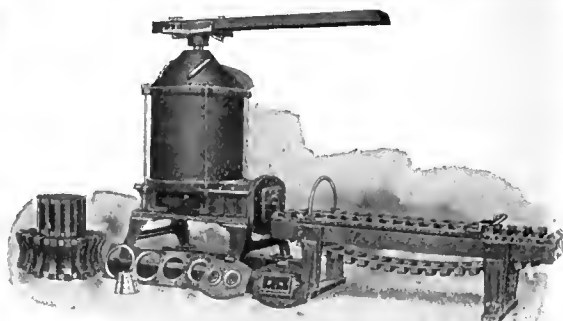
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THE IRRIGATION AGE

VOL. XXI

CHICAGO, OCTOBER, 1906.

No. 12

THE IRRIGATION AGE

With which is Merged

MODERN IRRIGATION
THE IRRIGATION ERA
ARID AMERICA

THE DRAINAGE JOURNAL
MID-WEST
THE FARM HERALD

THE D. H. ANDERSON PUBLISHING CO.,
PUBLISHERS,

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D. H. ANDERSON, Editor
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ANNOUNCEMENT.

"The Primer of Irrigation" is now ready for delivery. Price, \$2.00. If ordered in connection with subscription, the price is \$1.50.

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It may interest advertisers to know that *The Irrigation Age* is the only publication in the world having an actual paid in advance circulation among individual irrigators and large irrigation corporations. It is read regularly by all interested in this subject and has readers in all parts of the world. *The Irrigation Age* is 21 years old and is the pioneer publication of its class in the world.

Wide Tires.

In France every carrier's and every market cart, instead of injuring the highway, improves it. Many of the tires are ten inches wide. In the four-wheeled vehicles of that country the rear axle is fourteen inches longer than the fore, and as a result the rear wheels run in a line about an inch outside the level rolled by the front wheel. After a few loaded wagons have passed over a road the highway looks as if a steam roller had been at work. A national law in Germany prescribes that wagons heavily loaded must have tires not less than four inches wide. In Austria the minimum for similar vehicles is six and a half inches; in Switzerland, six inches.

Money in Circulation.

On the first of September the volume of money in circulation in the United States was the greatest on record, the amount being \$2,766,913,299. This is an increase of forty-five and a quarter millions over a year ago, and a gain of six hundred and seventy millions over the corresponding period of 1900. Many will be interested in knowing how our various forms of currency figure in the total amount. Here are the details: Gold coin, \$676,179,514; gold certificates, \$519,965,889; standard silver dollars, \$78,938,609; silver certificates, \$473,292,991; subsidiary silver, \$113,399,532; Treasury notes, \$7,112,252; United States notes, \$338,728,846; national bank notes, \$559,295,666.

On the fifth of September C. M. Heintz, editor of *The Rural Californian*, Los Angeles, died suddenly at his home in that city. When the editor of this paper met him last April in his office in Los Angeles, Mr. Heintz expressed his intention of attending the fourteenth National Irrigation Congress at Boise, Idaho, but his death occurred on the third day of the congress. No announcement of his demise was made at the congress, or resolutions of condolence would have been drawn up and sent to the bereaved family. The deceased was a personal friend of the editor of the *IRRIGATION AGE*, and one time was secretary of the National Irrigation Congress. No particulars as to the cause of his death have been given out.

The Reclamation Service has definitely put all of its engineers and experts on a cash basis. During the period of initiation of the work it was necessary to pay the men in the field not only their regular wages, but also to furnish them subsistence. With the creation of permanent camps or stations the necessity of furnishing rations no longer existed, and it seemed wise to require that all men, whether laborers or engineers, obtaining subsistence at these camps should pay a flat rate of seventy-five cents per day for meals furnished. This charge is accordingly deducted from the salaries or wages paid, and these are adjusted accordingly, so that salaries are now comparable on a money basis, and are not confused with the question of subsistence.

The Gunnison Tunnel.

More than one-half of the great Gunnison tunnel in Colorado was completed by the first of September, according to a report from the engineer in charge of the work. The total length from the east portal in Gunnison canyon to heading No. 1 on August 31 was 4,416 feet. The total length from the west portal, in Uncompahgre Valley, was 10,896 feet, making a total of 15,312 feet.

The Reclamation Service, which is prosecuting the work by force account, has broken the world's record in tunnel construction on this work. During July and August, however, the rate of progress was reduced on account of an extremely hard vein of rock in heading No. 1 and the treacherous ground in heading No. 2, which required handling with the utmost caution in order to prevent loss of life and destruction of property. The difficulties in connection with ventilation and transportation also increase with the length of tunnel from portals. Six hundred and ninety-eight feet were excavated during August. Machinery is in place and the work of placing concrete masonry will commence this month. Work on the south side canal is progressing satisfactorily.

The Wave of Prosperity. Throughout the Western States the wave of prosperity is rolling high. In California crops of all kinds are so immense, and trade so good, that the earthquake of last spring is practically forgotten. The reports which we have obtained from San Francisco, and which, in view of the exceptional conditions prevailing in that city, are not only wonderfully optimistic in tone, but show an actual, present prosperity which is nothing short of surprising. Wonderful progress is being made in Washington and Oregon, in Wyoming, Colorado, New Mexico and Arizona. In fact, the Far Western and Pacific States are among the most prosperous in the Union. In the great grain raising sections of the Central West the conditions are most encouraging. Despite reports of damage from various localities—in Missouri, for instance, there is evidence of the existence of a drought belt this season—the crops are evidently above the average, and the statements of our subscribers fully bear out the glowing reports published recently by the Department of Agriculture. Taking the country as a whole, it is evident not only that the material conditions are most favorable to a continuance of prosperity, but that all branches of trade is chock full of confidence and enthusiasm.

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Development of Pumping in Arkansas Valley, Kansas.

In September, 1905, the Secretary of the Interior approved the plans for the construction of a pumping plant in the Arkansas Valley, near Garden City, Kansas, to supply water to the Farmers' Ditch. Contracts have been let and the work of construction of this project is now under way under the supervision of the United States Reclamation Service.

Charles S. Slichter, of Madison, Wisconsin, who made an extensive investigation of the movement of the underground waters of the Arkansas Valley, was in Washington recently, and is most enthusiastic over the future of that portion of Kansas. He said: "The stimulus given to this part of the Arkansas Valley by the proposed pumping plant has greatly developed the installation of pumping plants by private parties. The census recently taken shows that 162 privately built pumping plants have been put in service in the Arkansas Valley within the last twelve months.

"A large number of these pumping plants are operated by gasoline engines. A few that have been installed at Rocky Ford, Colorado, use hard coal in gas generators which supply gas engines. These gas plants at Rocky Ford show very remarkable results in the production of power at low cost. A test of a thirty-five horse power pumping engine at Rocky Ford for ten days during the month of May, 1906, showed that the cost of coal per hour averaged but seven cents. At this place the fuel used costs \$6 per ton at the ranch.

"It is believed that the development of the bottom lands in Arkansas Valley by private pumping plants has just begun, and a very large number of new ones will be put in during the present year."

Status of Irrigation in Oklahoma. Irrigation in Oklahoma under the terms of the Reclamation Act has been delayed because all of the examinations and surveys that have been made have failed so far to develop a practical project from an economic standpoint. The engineers in the field have been seriously hampered by the rainy weather and flooded streams.

As a preliminary and essential element of the investigation, it was decided to erect a pumping plant to utilize the river water and determine by actual experiment whether it was too saline for use on most crops. The machinery was accordingly ordered and has finally been installed after many vexatious delays due to floods and boggy roads. The pump is now set, the canals from it are constructed, and the plant is in good working order.

This has been an exceptionally wet year. If next year is ordinarily dry it will be possible to show what

can be done with irrigation, but with the perversity of inanimate things the natural forces all seem to combine against giving the pumping plant a satisfactory trial. There is no doubt that years of drouth will come when irrigation will be badly needed, but at present the farmers are growing good crops by dependence upon natural rainfall.

The engineers are continuing their investigations and will soon be able to make a full report upon the Red River project. They will also make investigations as to the quantity and quality of underground waters with reference to their use for irrigation. If these investigations prove satisfactory as to the water supply, another pumping plant will probably be installed for experiment with ground waters. The surveys and investigations in Oklahoma will not cease until a practicable project is found, or it is demonstrated that the proper conditions do not exist for economical irrigation.

The Reclamation Service.

A significant change has taken place in the attitude of the people of the West toward the Reclamation Service. When the work began four years ago there was heard on all sides the statement that the Government should not interfere with private development, fears were expressed that in the great works to be built the Government would in some way interfere with money-making by individuals.

In one sense it has been impossible not to interfere with private enterprise, since on nearly all projects some individual or another has made filings on lands or waters and was endeavoring to sell these filings to Eastern investors. The construction by the Government of a single large project, developing the country to its utmost, has frequently, in the minds of promoters at least interfered with their smaller schemes. This condition is being changed. All of the projects to be considered during the next few years have been determined upon, and all questions of private rights have been practically settled by purchase or agreement. Now comes the demand for more work, and in the anxiety to extend operations the promoters have forgotten their fear that the Government would interfere with private enterprise, and are more fearful that it will not interfere in the sense that it will not buy out the various claims which are being offered for sale.

The experience of the Secretary of the Interior in buying these claims and in extinguishing the various vested rights under different projects has led to extreme caution. There is little probability that he will make any further purchases until the works now in hand are completed and are refunding money to the Treasury. The demand for a large increase to the reclamation fund does not meet with much sympathy from the authorities who have been endeavoring to negotiate these purchases.

J. H. Kurtz, who represented the State of Pennsylvania as delegate to the fourteenth National Irrigation Congress at Boise, as the specially designated representative of Governor Pennypacker, is a resident of Ephrata, in Lancaster county, Pa., though he has been in Ogden, Utah, since last December, settling up the matters of the estate of his brother, Thomas J. Kurtz. Mrs. Kurtz, who also attended the congress as a delegate, represented Utah, having been especially appointed by Mayor E. M. Conroy, of Ogden, and the pair, always being together and wearing the badges of two such distant States, were the subjects of much jocular comment.

Mr. Kurtz was one of the men who favored the taking of the next congress to Jamestown, Va., and voted for this from the first to the last. As is well known, the decision was in favor of Sacramento. It was not because of localism that he favored a session of the congress in the East, but because he has ideals of his own that he wishes to put into practical effect for the reclamation of the arid lands of the West. He urged a conference and congress to be held in some of the Eastern States, and as near to Washington as possible, for the reason that he has studied the question and sees that the reclamation fund is being depleted. He explained his views in these words:

"If the grand plan of reclaiming the millions of acres of the arid lands of the Rocky Mountain country is carried to a finality, money will have to be raised by Congress. If we hold all of the irrigation congresses out West the bulk of the lawmakers in our national legislature will not learn our necessities. One congress, with the exhibits of fruits and grains that are raised in the West by irrigation, held in some of the populous Eastern States would give congressmen and senators a chance to see what is being attempted, and with success, on what was once a series of deserts."

Mr. Kurtz has been the representative of the State of Pennsylvania at the eleventh, twelfth, thirteenth and fourteenth irrigation congresses. The first was in 1903, at Ogden, where he is now residing, perhaps temporarily; the next at El Paso, Texas, in 1904; the third at Portland, in 1905, and this year the fourteenth, at Boise, Idaho, believed to be the most successful in material results of any congress heretofore held.

Mr. Kurtz states that it is not only that the big end of the people's representatives in the national legislature might get better and broader ideas of the reclamation of the arid lands of the West, and of the advantages from that reclamation that would ensue to the nation, but also to present the actual conditions to the people so that they would understand the great possibilities that exist in this section. He sees, by such a congress held in some of the Eastern States, a

suggestive means of relieving the congestion of overpopulated communities. He believes that the inhabitants of American cities are workers. Too many localities, he urges, are overcrowded, and the great West needs them all. His idea is, that while the irrigation congresses have been held in cities that extend over an area as great or greater than several European monarchies combined, its operations have been more or less localized, even in our great nation.

The great argument advanced by Mr. Kurtz is that the Reclamation fund is now being rapidly depleted. His remedy is to devise, or have others devise, a means for its repletion.

Intelligence on the Farm. A man who enters any of the professions these days without having first fitted himself in some school, or without having acquired a practical knowledge of the business to which he intends to devote his life, is behind the times. There is no place in the twentieth century for the person who is not proficient, and particularly is this true in this country, where competition is so keen and a man not only has to devote his time and untiring energy, but his brain and ingenuity as well. The laggard and he who is slothful and careless finds himself in the rear of the procession. The successful business man, in whatever branch of the world's activity he plants himself, is the one who is continually seeking information on the latest and most approved methods of doing things.

Particularly is this true with the farming element. The cattle feeder makes little success unless he utilizes the experiences which have likely cost his predecessor dearly to learn. The farmer does not do justice to himself nor to his soil if he does not study the requirements of his land. Soil eats just the same as people do and if its requirements are not met it deteriorates and will not bring forth what is expected of it. The agricultural schools run by the various States and fostered by the Government are kindergartens in which the novice at farming and stock production can go and become proficient. The time has passed in which farmers were wont to scoff at institutions whose ostensible business it was to inform them. Everyone now admits that the agricultural college is a valuable, and indispensable adjunct to a successful farming career. The little-minded man who never could be taught by a "professor," who, he claimed, was a theoretical and not a practical farmer, has shriveled up and blown away. The agricultural colleges, through their splendid work in tutoring the farming classes, have done their share in hoisting our country to the topmost in the world's agricultural domains. And there is no reason why their achievements in the past may not be proven the very beginning in making the soil and other elements and agencies contribute to the welfare of the one who cultivates it.

Arizona. In 1870 there were but 172 farms in the territory, covering but 22,000 acres. By 1890 there were 1,400 with 1,300,000 acres. In 1900 there were nearly 6,000, with nearly 2,000,000 acres and worth nearly \$30,000,000. This land, practically all under irrigation, produced a return averaging more than \$60 an acre. This advance tells the story of plucky business men and farmers who met the irrigation problem and solved it with their own brains and their own capital.

Now that the Government has taken hold of it and the Colorado River, the Salt, and the Gila are to be robbed of their floods to fill irrigation ditches as soon as the dams are completed at Rincon and Yuma, new miles of rich alfalfa fields and fruitful orchards will widen Arizona's strips of green carpet. Oranges ripen in the Salt River Valley earlier than anywhere else in the United States, and they bring a higher price than any others. Dates are now being grown successfully there. There is no better climate for melons, fruits, grains, and alfalfa than southern Arizona; there is no agricultural enterprise more alluring than intensive farming where there is no possibility of crop failures. People are only too ready to flock in wherever water can be had, and these farmers who come in are men of the same type that have made the commonwealth of Oklahoma. More will come in, when the Yuma and the Tonto dams are completed. There are 10,000,000 acres of land in the territory susceptible of irrigation and only 1,000,000 acres have thus far been reclaimed.

Besides the farms, Arizona has leagues of grazing land, on which are to be seen sleek herds of fattening cattle, and its forests are even greater in extent than those of New Mexico. Lumber is shipped from Flagstaff to all parts of the country. About 200,000,000 feet of lumber is cut every year, mostly in the northern part of the territory. Much of it is shipped in manufactured form. About \$3,000,000 worth of sheep, cattle and horses are sold from the ranges annually. But the chief asset of the territory is her wealth of minerals. Arizona is now the leading copper producing center of the world, and its output of gold and silver is very considerable. Its total mining output amounts to more than \$40,000,000 a year. Mines like the United Verde and the Copper Queen support prosperous towns like Bisbee, Globe and Jerome. There are nearly 2,000 patented mines, and all mining experts agree that the 30,000,000 acres of Arizona's mineral belt have thus far been merely scratched.

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Hon. George E. Barstow. Georges Eames Barstow, manufacturer, merchant, financier and statesman, was born in Providence, R. I., November 19, 1849. He was the son of Amos Chaffee and Emeline Mumford (Eames) Barstow. The Barstow family traces its lineage back to the thirteenth century in French Normandy. The name at that time was de Barstowe. The prefix and affix of the name were dropped after the Barstows migrated to the West Riding, of Yorkshire, England. They were charter members of the town of Hanover, Mass., in 1636; and of Dedham, Mass., in 1637.

Until within ten years past, Mr. Barstow was prominently identified in public and private affairs in his native city and state of Providence, R. I., since which time his home has been in New York City and Barstow, Texas.

Mr. Barstow received his education in the public schools and Mowry & Goff's Classical School, of Providence, R. I. He began his business career at seventeen years of age, acquiring a thorough knowledge of textile manufacturing, financiering and a complete training in general affairs. Among the many concerns which he has either founded, or financed, is the Barstow Thread Company, Providence Warehouse Company, National and Providence Worsted Mills, American Writing Paper Company, United States Envelope Company, Barstow Irrigation Company and the Barstow Town Company, Barstow, Texas.

Besides his successful business career, he has always taken an active part in municipal, state and church affairs, and in public education. He was for fourteen years a member of the school board of the city of Providence; and the last year, the president thereof. He was for four years a member of the Providence common council and was elected a representative in the Rhode Island General Assembly for three successive terms. During his legislative conduct, he served on several important commissions, and was the father of the act putting into operation the "Bertillon system" for measuring criminals. Also an amendment to the criminal law concerning the punishment of habitual criminals. Also the so-called "anti-lottery act."

Mr. Barstow was the pioneer in irrigation of arid lands in the Southwest and founder of the town of Barstow, county seat of Ward county, Texas, in the year 1894. Simultaneous with the founding of the town, Mr. Barstow constructed most substantial irrigation works, capable of irrigating 40,000 acres of land, all of the said works being located in the valley surrounding the town of Barstow. The products obtained from the lands under this system have become famous throughout the United States. By Mr. Barstow's energy and foresight and persistent application, he has made more than two blades of grass grow in this desert land where nothing but mesquite grew before.

Notwithstanding Mr. Barstow has been untiring

in his application to public and private affairs, he has always found some time to spend with the best writers of history and fiction. His various contributions to the press, both in prose and song, have discovered not only his ability, but also his love of association with those elements that lead to refinement in life and character. His love of travel has led him to many times skirt his native land, besides paying several visits to the countries of other peoples to study their habits, and enter into the full enjoyment of their productions in art and music, and revel in all the beauties that nature has there produced.

He is a member of the Rhode Island Historical Society, Empire Society Sons American Revolution, American Academy of Social and Political Science and Pennsylvania Society of Fine Arts, Philadelphia, Pa.; National Geographic Society and Southern Historical Association, Washington, D. C.; National Irrigation, Forestry and Home Settlement Associations, Lawyers' New York and Republican Clubs, Metropolitan Museum of Art and Museum of Natural History, New York City, and Trustee of the Hartford Theological Seminary, Hartford, Conn., a life director of the Euphrates College, Harpoot, Turkey, third vice-president National Irrigation Congress, honorary member of the Dallas Commercial Club, and other clubs and associations.

Mr. Barstow married Miss Clara Drew Symonds, of Providence, R. I., on October 19, 1871. They have been blessed with nine children, all of whom are now living, except the youngest.

Cost of Plowing by Electricity.	Israel Hoagland, an Indiana inventor, estimates the cost of breaking ground by means of electric power, drawn from trolley wires, at 50 cents or less per acre, as compared with \$1.50 per acre by horse power. The cost of a motor outfit and five plows he estimates at \$500. Capacity of this, twenty acres per day at 50 cents; cost of same, using sixteen head of horses and harness and eight men per acre, \$1.50, or a total of \$3.00 per day; cost of twenty acres per motor power and two men, \$10; cost, difference 66 per cent less, or \$20.
--	--

Such a saving in time and money will make the electric motor plows immensely popular, and it will be impossible for some years to come to supply the demand. But the invention is not yet fully perfected, we believe, and the manufacturing company has not been organized, nor is it certain that satisfactory arrangements can be made for securing the necessary power from the inter-urban electric companies. Our readers, therefore, need not make calculations to give up their horse or mule teams for electricity this season, at any rate.

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THE VALUE OF A HIGH DUTY OF WATER AND THE MEANS OF OBTAINING IT.

Amount and Value of Irrigation Water.

BY SAMUEL FORTIER

Irrigation Engineer, in charge Pacific District Irrigation and Drainage Investigations, Office of Experimental Stations.

There are now used on the irrigated portions of the United States about five million miners' inches of water annually. The cost of this for each miners' inch varies all the way from 50 cents to \$150, and would average in the neighborhood of \$500 per miners' inch. This represents a yearly expenditure of \$25,000,000 for water to irrigate land.

Assuming that the area irrigated is ten million acres and that the average cost of applying water each irrigation season is \$2.50 per acre, the yearly expenditure for this purpose on all the land irrigated would aggregate an additional \$25,000,000.

Thus it appears that the farmers of the irrigated districts of America are expending annually about

which is now wasted and all of the money now used in furnishing and applying it, I would answer—No. It is, however, possible and entirely within the province of feasibility and profitable investment to save a large part of this waste.

SOME REASONS FOR INCREASING THE DUTY.

Many reasons might be advanced in favor of a more economical use of irrigation water. To begin with, there is the question of cost. If it be a fact that nearly three-fourths of the water taken from streams for irrigation purposes is wasted, then a saving of even one-third of this loss would represent an immense gain.

It is likewise true that water is every year becoming more difficult to secure and of higher value. The rapid growth of Western cities has multiplied the demand for water for municipal purposes, the development of water privileges for electric transmission lines has utilized the streams for mechanical purposes and the extension of the irrigated area has made increased drafts on all sources of water supply.

Another reason for insisting upon a higher duty of water in irrigation at the present time is that customs soon crystallize into law. Men who appropriate and use water in a slipshod manner for a number of years will lay claim not only to that portion which they use, but to that larger portion which they waste.

Furthermore, the prosperity and material greatness of western America is founded upon the water supply, and every gallon that is wasted detracts that much from the possibilities of this region. The State of Montana may serve to illustrate what I mean. Montana occupies the crest of the continent, and, compared with other arid States, is well watered. Its total area of 93,000,000 acres contains some of the finest agricultural lands on this continent. These arable lands would probably exceed 15,000,000 acres in extent, and might reach 20,000,000 acres. Yet the total area that is ever likely to be irrigated from streams, reservoirs and wells will not exceed, we believe, 6,000,000 acres. On account of the limitations of the water supply, the short period of vegetable growth, and the long distance between many of the irrigated tracts and the nearest rivers, only a small part of the arable land of Montana can ever be irrigated. This estimate of a total of 6,000,000 acres is based on an average duty of water of two acre-feet per annum. The average use of water in that State is now over four acre-feet and if no improvements in the use of water are brought about the limit will be reached when three million acres are irrigated. This shows what the ultimate difference in one of the Western States will be between a low and high duty. It is the difference between 3,000,000 irrigated acres and 6,000,000 acres. It is the difference between a total yearly revenue from irrigated agriculture of \$45,000,000 and \$90,000,000.

Finally, the excessive use of water on irrigated lands water-logs the soil in low lying places, brings up



Prof. Samuel Fortier, Berkeley, Cal.

\$50,000,000 for water and for the labor and equipment necessary in supplying it to cultivated crops. The sole purpose of spending so vast a sum each year is to produce food stuffs for the subsistence of man and the domestic animals under his care. It is, however, no exaggeration to state that in the accomplishment of this purpose fully 70 per cent of the money and labor spent in securing and applying water is wasted.

We believe this fact has been fully demonstrated, that for every 100 miners' inches diverted from natural streams and storage reservoirs less than 30 miners' inches are utilized by cultivated plants in a beneficial way. This means that out of an expenditure of \$50,000,000 a year less than \$15,000,000 is put to a beneficial use. How to save a part of the \$35,000,000 worth of water which is now wasted is one of the problems connected with this subject of irrigation. If you were to ask me if it were possible to save all of the water

alkali, and creates disease. Nearly every irrigated district in the West has its abandoned farms which have been rendered non-productive by an excessive use of water. Alfalfa fields which were at one time worth \$100 per acre, vineyards which sold readily for \$350 per acre, and orange groves that gave large dividends



A peep into the woods of western Oregon.

on a valuation of \$1,000 per acre, may now be purchased for from \$10 to \$30 per acre. The accumulation of seepage waters caused by over-irrigation and leaky ditches with all its accompanying evils has already damaged about 10 per cent of the irrigated lands of the West.

THE MOISTURE REQUIREMENTS OF CULTIVATED PLANTS.

The thirst of the plant must be satisfied in order to maintain a vigorous growth, but this does not mean a complete saturation of the soil around its roots. Plants require air as well as water, and if other conditions are favorable a comparatively small percentage of moisture in the soil will suffice. Ten pounds of free water in each one hundred pounds of soil is ample for most crops. By "free water" is meant the soil moisture which the fibrous roots absorb and which a hot sun is capable of evaporating from the soil. The application of four inches of water over the surface of a field on which plants are growing fairly well furnishes sufficient moisture for four feet of soil, providing it is evenly distributed without loss. Most of the troubles of the irrigator arise from his not being able to either apply or distribute this water evenly and without loss. Good soils and subsoils are never water tight. If they were impervious to the downward passage of water they would not produce crops. The irrigator is thus obliged to spread water over a more or less porous mass which may permit a large part to pass through it. If he attempts to keep the water for any length of time near the surface, it will speedily pass off as vapor into the atmosphere. His task, therefore, approaches in difficulties that of keeping water in a vessel with both ends

open. On the one side is a layer of warm, dry air, ever ready to suck up moisture; on the other, is a porous subsoil through which water is drawn by force of gravity. To guard against these and numerous other losses of irrigation water, the Western farmer must possess more accurate knowledge of the frequency and extent of the chief sources of waste. It is not enough, for example, to spread a certain volume of water over a field. He should endeavor to find out how much of this volume passes through the subsoil and collects, it may be, in his neighbor's low lying tract where the alkali salts are rising to the surface, and how much passes off into the atmosphere from the surface of the soil during the interval between irrigations.

THE CHIEF SOURCES OF WATER WASTE.

By beginning with the losses which take place on the irrigated field and tracing other losses back through a network of ditches and canals to the source of supply, I hope to convince you that for every four gallons taken from the stream, little more than one gallon subserves a useful purpose in nourishing crops.

You will admit, I believe, that water is more skilfully applied and more economically used in southern California than in any other portion of the West, and perhaps of the world. The Office of Experiment Stations, at Washington, is now printing some results of experiments in evaporation losses conducted last year in the vicinity of Riverside, California. We selected for our investigations the lands under the Gage Canal, which irrigated last year 8,500 acres of orange and lemon orchards, and we chose for our experiments



MR. J. H. KURTZ, Ephrata, Pa.
Delegate to Fourteenth National Irrigation Congress.
Hon. Vice-President for Pennsylvania.

some of the most skillfully irrigated tracts in that large area.

I may say in passing that the average duty of water on the orchards under the Gage Canal for the past seven years has been 25 inches and the irrigation

water combined with the rainfall has averaged $33\frac{1}{2}$ inches. This means that these orange and lemon trees have been kept growing continuously the year round on an amount of water less than the rainfall of Iowa.

Regarding the evaporation losses, it was shown that a heavily irrigated orchard soil lost by evaporation at the rate of over four inches per week, that a soil that was fairly moist on the surface and in good condition for crop growth lost about one inch per week, while a dry soil lost only one-fourth of an inch per week. The usual custom in this part of California is to water only once in every four or six weeks; to water the water in deep furrows; and to cultivate thoroughly after each watering to a depth of from six to ten inches. In this way, much of the water which would otherwise be lost by evaporation is saved. This, however, is not the practice in many parts of California, and more particularly in many of the mountain States. Cultivated crops are frequently irrigated and then left uncultivated until

cent, or 75 per cent in all. This would leave only 25 per cent to nourish the orange trees.

The great waste of water caused by uneven and rough surfaces and careless application are too common to call for any extended remarks. Then, too, some irrigators are so generous that they have always water to spare. They give the county roads a good soaking every time they irrigate the bordering fields. One can't find fault with the irrigator for working only ten hours a day, but unfortunately while he is sleeping or resting, the water is usually running to waste. Lack of constant attention may therefore be reckoned as another cause of much waste.

Next to the loss by evaporation, and frequently exceeding it, is the loss in transmission. In such channels as are used at the present time in the West for the conveyance of water one has usually to discount the flow at the head 33 per cent. As a rule, the cultivated fields do not receive more than 66 gallons



How Sugar Beets grow in Southeastern Idaho along the American Falls Canal and Power Co.'s Canal.

the next irrigation water is applied. Summing up this question of evaporation losses in irrigation, it is safe to assert that about one-half of the water which is applied to fields escapes into the atmosphere from the surface of the soil without in any way benefiting the plant. It is rather a positive injury in that during the process, it forms a crust on the surface which prevents air from getting to the roots and tends to draw up moisture from beneath. Some of the means that may be employed to lessen this great waste will be referred to later.

In irrigating orchards under the Gage Canal another source of waste was the percolation of water into the porous subsoil, and its subsequent passage to lower levels. In one orchard tract of ten acres the part of one irrigation lost by deep percolation was 28 per cent, and by evaporation from the surface of the soil 47 per

cent, or 75 per cent in all. This would leave only 25 per cent to nourish the orange trees.

In all these losses caused by evaporation, deep percolation, careless application, and leaky ditches, it is not surprising that only a small part of the water diverted from the natural streams finds its way to the fibrous rootlets of plants and is drawn up by them through the stem by the foliage.

WAYS AND MEANS OF INCREASING THE DUTY.

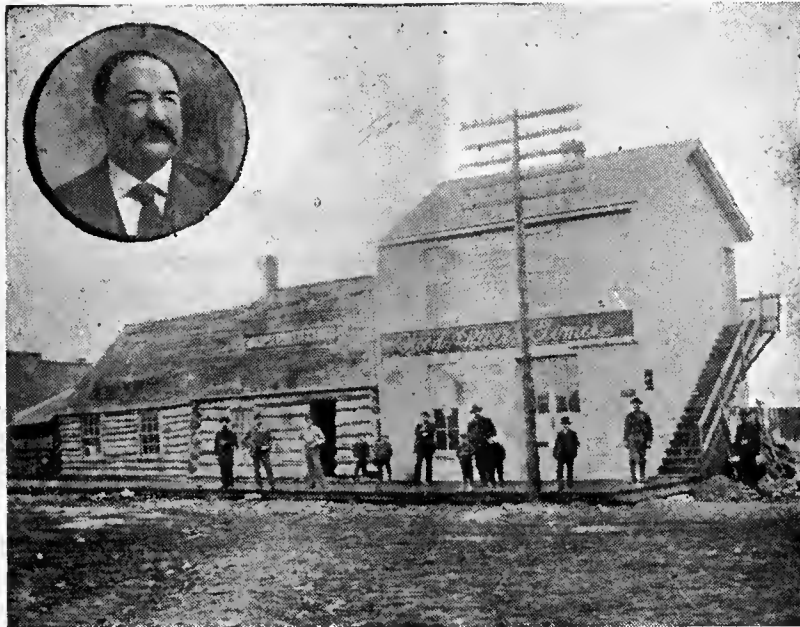
The irrigation department of the University of California, working in conjunction with the Office of Experiment Stations, is now carrying on experiments on the cheapest, and at the same time, the most efficient linings for canals. The tests are made in twelve separate ditches. Various kinds of cement concrete, cement plaster, crude oil, asphaltum, puddled clay and earth are used. In the course of a few months the results will be ready to be published.

This subject is attracting a great deal of attention at the present time. The increasing scarcity and value of water are compelling canal companies to take measures to stop some of the leaks. The losses due to seepage in new canals in particular are often enormously high. The other day a superintendent of a canal in the Sacramento Valley turned in 125 cubic feet per second of water and the volume available for irrigation was only 40 cubic feet. Fourteen miles of ditch had absorbed the balance. Another California canal superintendent in writing to our office stated that he had turned in 55 cubic feet through the head-gate of a new lateral and only had a stream of five cubic feet at the lower end. He wished to know what kind of lining we would recommend. These, it is true, are exceptional cases, but the large number of seepage measurements which have been made in the West during the past seven years under the supervision of Elwood Mead, of Washington, show quite conclusively the extent of this loss. It is on these more general results that I have based my estimate of this loss in conveying

one of the largest canals in the San Joaquin Valley changed their water contracts from the old form which allowed a specified amount per acre for the season without measurement to one which called for a measured volume per acre. Another irrigation district in California which used over 600 cubic feet per second last month is contemplating measuring each man's share next year, not so much to save water as to prevent excessive use and the removal of the surplus through drainage canals and pumping plants.

In the State of Washington, prior to 1903, the Sunnyside Canal could not furnish water for more than 25,000 acres. From 1903 to the present a complete system of weirs has been in operation and each man's share is measured. Last year the same canal carrying the same volume of water that it did in 1903 watered 38,000 acres.

An early and equitable settlement of claims to water is another means of increasing the duty of water. Existing claims to water may be grouped under three heads: 1. Those which have been adjudicated in a



Office of Wood River Times, Hailey, Idaho, with portrait of the Publisher, by whose kindness we were permitted to show many interesting pictures of Hailey and vicinity in our September issue.

water from the source to the irrigated fields. The remedy for these high transmission losses is more impervious channels. In improvements of this character the first step to take is to ascertain the extent of the loss of water and its value, and then to design and carry out the improvements in such a way that the investment will prove profitable. The uncertainty as to the effectiveness of certain canal linings induced us to conduct the series of experiments previously referred to, the results of which it is hoped will be a guide to good practice.

I believe the duty of water might be considerably increased by measuring each water user's share. The usual practice of contracting for a nominal amount of water per acre for the season and permitting either the user or the water master to guess at the amount delivered is, to say the least, a slipshod way of selling water and one which puts a premium on waste. Irrigation water in southern California is now delivered for the most part in measured volumes at stated intervals. No guess work would be tolerated. Last July

satisfactory manner. 2. Those which have been decreed excessive amounts. 3. Those which have not been judicially settled or even defined. Now it will be generally conceded, I believe, that the first group contains fewer claims than the second, and that the third contains more than the first and second combined. A decree which empowers a water user to divert more water than he can economically use could not prove otherwise than wasteful of water. So long, also, as claims remain unsettled, so long will claimants make a pretense of using more than they really need in order to substantiate their claims for an ample supply.

There are several other means of obtaining a high duty of water whose importance is so generally recognized that I shall do no more than to name them. Some of these are, the skillful application of water, thorough preparation of the soil, well made ditches and an efficient system of distributing and delivering of the amount of water to which each user is entitled.

In conclusion, I can but refer briefly to some of the practical methods that may be employed to check

the excessive evaporation losses from soil surfaces. The results of our experiments thus far seem to show that about one-half of the water which is spread over fields in irrigation passes off into the air without benefiting the plants.

The greater part of this loss occurs during the time when water is applied and for a day or two afterwards. On orchard soils in warm weather the evaporation from the soil may reach 70 tons per acre in 24 hours. Now it has been shown that the cultivation of the surface to a depth of six inches prevents more than one-half of the subsequent loss.

The use of well pulverized soil mulches is another means of checking evaporation. The tests conducted in southern California show that a 10-inch layer of dry granular soil gives complete protection, that an 8-inch layer will save five-sixths of the moisture beneath, and a 4-inch layer two-thirds of the moisture.

COLORADO.

Irrigation as a State Developer.

BY JOHN EDWARD BUCK.

PUEBLO, Colo., July 28.—Colorado is a State of unlimited resources, both mineral and agricultural. In acres the area of the State is 66,560,000, one-third of which is arable. More than 2,000,000 acres are already under cultivation, and 4,000,000 acres can be reclaimed by means of irrigation. Here as elsewhere throughout the semi-arid region through which we have traversed over the Northern Pacific, Southern Pacific and San Pedro Railroads, irrigation is a great State developer, and has already worked miracles in enhancing the quality and increasing the yield of cereals, fruits and vegetables.



Garden Spot, near Blackfoot, Idaho.—On American Falls Canal.

Wherever it is practical and for deep-rooted plants, deep irrigation should be practiced, since it retards evaporation. On a citrus orchard near Riverside, in August of 1905, for every 137 gallons which were evaporated from surface irrigation, only 98 gallons were evaporated from furrows nine inches deep.

Some crops cannot be cultivated during the period of growth, but even in the case of these much can be done to check evaporation from the surface. One means is to irrigate less often and apply larger quantities. In following this practice the bulk of the water will be placed beyond the reach of the agencies which vaporize moisture. Another means which is frequently employed is to apply the water after sunset. The main factor in evaporation is temperature. Warm water at 89 degrees Fahr. loses by evaporation about seven times more than cold water at 54 degrees. The difference between day and night temperatures in the West is usually 25 degrees; hence the advantage of supplying water after sunset.

In many respects Colorado is unique. The State may be said to be the summit of the North American continent, for from its craggy apex rivers flow in every direction. The headwaters of no less than five great river systems are to be found in the melting snows of Colorado's mountains.

Colorado is almost midway between the oceans. The clouds which rise from evaporation in the Pacific, the Atlantic, the Great Lakes or the Gulf of Mexico are largely dissipated before they get to Colorado. Only the highest peaks and bare ridges catch the clouds to extract their moisture to make them white mantles of snow. Being high in elevation, Colorado enjoys a cool climate. Being far from the sea, Colorado enjoys a cloudless climate. This means a great deal of sunshine, without burning heat. There are other arid regions, south of Colorado, but being lower down they are too hot to make the finest quality in fruit or vegetable. There are other high regions, further north, but they are so far north that the climate is too cool. The

valleys of Colorado and northern New Mexico are located just right.

Irrigation is the connecting link between the dry, arid climate of Colorado and the inexhaustibly rich soil. By irrigation the streams which for ages have

with, and then has easy down-hill work to get the fertilizing flow over every foot of it. The labor of irrigation is equal to about one-half the time the Eastern farmer loses by bad weather, and about one-fifth the hard work he puts in on muddy roads. Many men have



Castlewood Dam, Colorado.

flowed through dry valleys toward the sea have been made to water the ground, and make the desert to blossom as the rose.

Colorado is the roof-tree of the continent. The land slopes away in every direction. The valleys have a very heavy fall, often 20 or more feet to the mile. Water will flow readily on a slope of only a few inches to the mile. The builder of an irrigating ditch taps the stream a few miles above the land he wants to irrigate and leads his ditch or canal away from the

learned to be skilled irrigators in less than a week. There are few that can not master all the details of the science in a single season.

Speaking in general, the majority of settlers coming to Colorado will have to buy their water rights, either from the Government in the case of the Uncompahgre project, or from private ditch companies in most of the other valleys. The first settlers took advantage of most of the easy irrigation projects. The lands now offered for settlement are mostly lands in which serious



A Canon City Fruit Grower's Home, Colorado.

stream at an angle. If the stream is falling at the rate of 20 feet to the mile, and the ditch is given a fall of two feet to the mile, each mile traversed will find the ditch 18 feet higher above the river. As it grows higher from the stream, the ditch gets further and further away. In ten miles, there may be a strip of land five miles wide, sloping from the ditch back to the river. If the canal is tapped the water can be led in laterals to the sides of fields, then down through furrows, or spread out in sheets over the crops.

A Colorado irrigator plans his work carefully, gets the water to the highest places of his farm to begin

engineering problems have been overcome to provide water. Ditches have been brought down canons on high flumes to reach the heads of valleys, tunnels have been run to bring unused flows from streams where there was a surplus of water into valleys where water was scarce. Ditches have even crossed the Continental Divide in Colorado. Millions of dollars have been spent in the construction of reservoirs, in which the floods of June, when the snows melt fast on the high mountains, are stored to reinforce the scantier flows of the streams in July and August.

The man who buys farming or orchard land in

Colorado pays mostly for his water right. In some cases this water right takes the form of a contract by which the water company, in consideration of a payment down and of the payment of an annual maintenance charge, agrees to deliver an agreed amount of water annually during the irrigating season. In other cases, a water right consists in ditch stock, by buying which the settler acquires a proportionate right in a canal or ditch, with all its rights to the use of water, its canals, dams, reservoirs and laterals. In such case, when settlement is completed, the farmers own their own ditch and run it to suit themselves.

The appropriation of water from the streams of Colorado, the sale of water rights, the management of canals, the annual assessments and other details of irrigation have been carefully regulated by the laws of Colorado, so there is little danger of a stranger,

ripen them. He can make the wheat berries fill fuller by watering them when the grain is "in milk." The Colorado onion grower keeps his bulbs growing until time to ripen, then dries them off into perfect keeping qualities. By keeping his potatoes always evenly moist, he makes them smooth and free from knobs and second growths.

With the single exception of corn, there is not a crop common to the temperate zone that can not be raised in the valleys of Colorado, of a quality better than that elsewhere. But there are certain crops that have been found so perfectly adapted to Colorado's soil and climate that they almost might be claimed as exclusive Colorado products.

Alfalfa and field peas have a double importance to the State, for they not only afford profitable crops, upon which are based immense and rapidly increasing



An Arkansas Valley Orchard with Bee Hives, Colorado.

even though ignorant of irrigation affairs, being deceived in what he is getting when he buys a water right.

Irrigation is not a mere expedient for getting the ground wet because it will not rain. Irrigation farming is an improvement in every way on farming by rainfall.

The farmer in a rainy country suffers fully as much because it rains too much at the *wrong time*, as he does because it does not rain when his crops need moisture. Rarely does the farmer want all his ground wet at the same time. Some crops thrive when moist, and some are spoiled by moisture.

In an irrigated country the farmer can always depend upon dry, sunny weather, and so he can regulate the exact degree of moisture exactly to suit any crop. The very color and texture of fruits and vegetables can be regulated by irrigation. The irrigation farmer can keep his crops growing until they have attained their maximum, then shut off the water and

live stock interests, but they afford a safe, sure and inexpensive method of renewing the soil's fertility.

Nitrogen is an element which every plant has to have, to grow well. Nitrogen does not come from the grinding up of rocks, and it is therefore the only essential of fertility which is not to be found in Colorado soil in inexhaustible quantities. More than half of the air we breathe is nitrogen, but in this form it is not available for plant growth. But by a peculiar partnership with certain bacteria, alfalfa and field peas possess the property of drawing nitrogen out of the air, not only enough for their own use but a surplus which is left in the ground for following crops. The Eastern farmer, when his crops languish, buys nitrates at a cost of \$20 to \$40 per ton, and spreads them on his fields, but the Colorado farmer, has simply to put in a crop which is itself profitable, and reap the same benefits.

On the opposite page is a photograph of the root system of a field pea. The mass of roots, it will be

seen, is mingled with little lumps or "nodules." Each of these is a colony of bacteria, drawing nitrogen from the air. The alfalfa or pea roots run through the lumps and take out what nitrates are needed for the growing plant. When the crop is harvested, and the ground plowed, the nitrates are still there. Nitrogen in vegetables is what makes red blood in the men or the animals that eat them. The gluten of wheat, the protein of beans, the strength-giving qualities of cabbage and onions, and all other vegetables, are all forms of nitrogen.

And here Nature again supplements the advantages of Colorado with still another advantage. Nitrogen products tend to be acid. A field in the East that gets too rich in nitrogen gets sour. The farmer has to buy gyp-



Roots of the Field Pea Plant, Colorado.

sum, or old plaster, or lime, or wood ashes, or some sort of alkali and sweeten his ground before he can raise a crop on it. But there are mountains of lime and gypsum at the head of almost every Colorado valley and all the soil has fine particles of lime and gypsum through it. So no matter how rich the ground becomes, it is still sweet and alkaline. The alfalfa and peas bacteria, too, need an alkaline soil to develop their full strength.

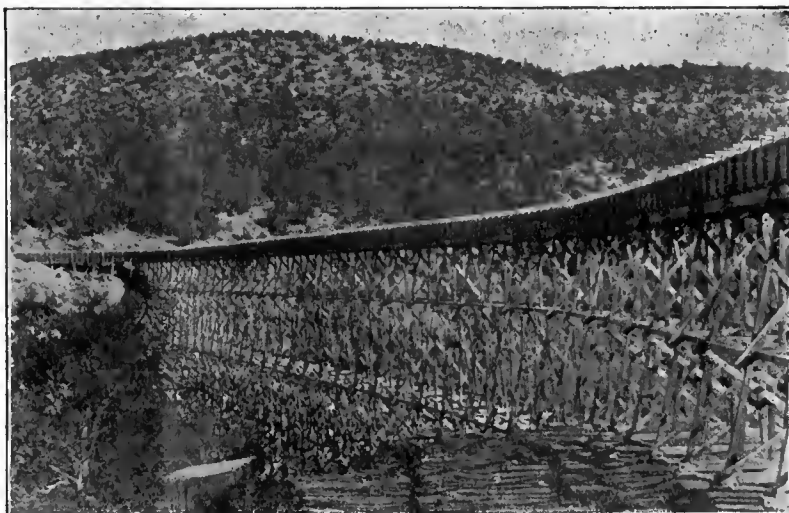
Alfalfa, without any regard to what it does for the soil, is in itself a bonanza crop. It is a plant of the clover family, a perennial, which sends long, tapering roots ten to thirty feet into the ground. This immense root is supplemented by a mass of smaller rootlets, with attendant nitrogen nodules. With this great root system, the plant grows at the rate of more than an inch a day. Three and four crops of hay are harvested every season.

Alfalfa, while growing, is the deepest, living green that ever beautified a landscape. When ready to cut, an alfalfa field is a sea of fragrant purple blossoms making the finest bee pasture and honey known. Alfalfa hay is rich green in color, sweet in taste. It is the staff of life in a Colorado barnyard. Horses work on it without grain, dairy cows give their richest milk, cattle and sheep fatten with only a little corn, even pigs eat the dry hay readily and can be pastured all summer in a field.

For chickens, finely ground alfalfa meal is sold at high prices in the East as an egg-compelling nostrum. Chemical analysis shows alfalfa to contain almost exactly twice the digestible elements that a ton of the best timothy hay contains. Alfalfa is so rich that it can not be cured except in a dry climate. In the East the hay musts and spoils in the dampness.

Alfalfa will grow as high as 8,000 feet, but not readily above 7,000 feet. At the higher levels, up to 10,000 feet, however, the Colorado farmer has the field pea. If an Iowa farmer were shown a patch of Colorado field peas, he would not believe that it was the same crop he raises at home. In Iowa, and in Canada, where the field pea originated, the peas are planted in early spring. The vines grow two or three feet high and set on a few pods. Then the blistering hot weather comes, the pea vines turn yellow and die, and unless the crop is harvested early in July the peas will fall to the ground and the weevils will get them. In the high valleys of Colorado, the peas keep right on growing all summer. There are no blights to destroy the leaves and stems, no weevils to attack the peas. The pods keep green and hold the peas all summer. By fall, the vines are five to ten feet long, with a pair of pods at each joint and half a dozen peas in each pod. Then the farmer can turn in lambs and fatten them, or he can turn in hogs and fatten them and make the finest mutton or the finest pork at just about half what it costs to fatten mutton or pork in the corn belt, and the growing of the peas and feeding them will leave his soil very much richer than before the crop was raised.

All the sugar in a beet comes from the sun that shines on the leaves. It is the sun which, by some mysterious chemical action, changes the starch in the juices into sugar. The sugar is taken up from the soil in connection with certain mineral salts. Colorado soil is rich in these salts, so plenty of starch is made in the roots. The leaves are bathed in sunshine all day, so the starch is converted into sugar. This is why the



Pinon Canal, Flume, Colorado.

sugar beet is a different plant in Colorado. Every year the average sugar content of the beets raised for the factories of the State is increased, and at the same time the average tonnage per acre is increased.

The University of Nebraska has published an address entitled "Some Problems Confronting Nebraska Farmers," by Hon. William G. Whitmore, regent of the University.

W. E. Embry, secretary of the Dade City Board of Trade, Dade City, Fla., has published an instructive booklet entitled "Pasco County, Florida," which will be mailed to anyone on receipt of request.

THE DUTY OF WATER AND THE BEST METHODS OF APPLYING IT.

By A. MCPHERSON, Superintendent of Agriculture, Twin Falls Tr. ct.

In discussing this question, it is necessary to take into consideration the character and depth of the soil, the cultural methods, the lay of the land, precipitation, etc. It is also necessary to consider whether the land had ever been irrigated or not.

These conditions vary considerably in the arid districts, and this being true, I think it best to confine my remarks to the Twin Falls tract, where I am now located.

The soil of the Twin Falls tract is commonly considered to be of volcanic origin, varying from two feet to an unknown depth, consisting of very fine particles.

When we began work on the Twin Falls Experimental Farm in 1905, we dug prospect holes from seven to ten feet in depth in order to determine the character of the soil, and the amount of moisture present. The only difference we observed in the soil was that the first foot was somewhat darker in color. With regard to moisture, the first eighteen inches contained some moisture, but below, it was perfectly dry, consequently we irrigated before planting. It required twenty-four to thirty-six hours to saturate to a depth varying from seven to ten feet.

No effort was made to determine the quantity of water used during the season after that.

This year (1906) it was determined to measure the amount of water used on the farm, and the amount running off as waste, as well as the evaporation, with a view to determining the quantity of water necessary to keep the soil in proper condition.

The miners' inch was used in measuring half a cubic foot per second for the farm, and a device was employed in connection to obviate any fluctuation in the head. A weir with an automatic register attached was used as a check on the miners' inch measurement in order that we might be sure that just the amount of water desired was supplied.

At the lower end of the farm, a weir and register was installed for measuring the waste. Elias Nelson, of the Bureau of Irrigation and Drainage Investigation, added an evaporating tank.

We began irrigating May 2, with the amount of water allowed under the contract between the settlers and the Twin Falls Land & Water Company—that is, one-eightieth of a cubic foot per second per acre, continuous flow.

The amount of water applied during each month up to the first of September, 1906, is given below, as well as the waste and evaporation:

	Applied.	Precipitation.	Total Am't.
In May.....	6.99 in.	1.58 in.	8.57 in.
Waste		Percentage	
.209		3%	
Evaporation		Percentage	
4.99		58.2%	
Difference		Percentage	
(or water retained by the soil)			
3.37		39.3%	

	Applied.	Precipitation.	Total Am't.
In June	7.74 in.	2.72 in.	10.46 in.
Waste		Percentage	
.309		4%	
Evaporation		Percentage	
6.81		65.1%	
Difference		Percentage	
(or water retained by the soil)			
3.34		31.9%	
In July	10.09 in.	.09 in.	10.18 in.
Waste		Percentage	
.98 in.		9.7%	
Evaporation		Percentage	
9.02		88.6%	
Difference		Percentage	
(or water retained by the soil)			
.18 in.		1.7%	
In August ..	6.79 in.	.1 in.	6.89 in.
Waste		Percentage	
.84		12.4%	
Evaporation		Percentage	
7.24		105.07%	
Difference		Percentage	
(or water retained by the soil)			
1.19 loss		17.2 loss	
Total amount applied.....			36.10 in.
Total percentage, 100%			
Total amount precipitation			4.49 in.
Total percentage, 12.4%			
Total amount wasted			2.34 in.
Total percentage, 7.4%			
Total amount evaporated			28.06 in.
Total percentage, 77.7%			
Total per cent wasted			7.4 in.
Total per cent evaporated.....			77.7 in.
Total difference (or water retained by the soil) ..			5.694 in.
Total percentage, 15.82%			

It will be noticed that the waste during the month of July was greater than any other month. This occurred while we were irrigating the lower tier of plats, and no opportunity was afforded whereby we could again use the waste.

The farm consists of forty acres, and being an experimental farm, there are a great many different crops grown, requiring water at different times and in varying quantities.

It will also be noticed that the evaporation almost equaled the amount of water applied during this month, less the waste and evaporation as shown by the evaporating tank.

Assuming that the evaporation from the water-free surface in the tank was equal to the amount evaporated from the ground, plus the amount used by the

crops, we can have some idea of the amount of water actually required.

No doubt if less water had been applied, the results, as far as the crop production is concerned, would have been the same or greater, as was indicated by some tests made by Mr. Nelson, showing that the third foot of soil lost much less moisture in a given time than the first or second foot. The roots of certain crops penetrate to a depth where they would be able to draw upon the moisture to a greater depth than the shallow rooted ones.

If all the crops grown had been of the kind that could have been cultivated, thus conserving the moisture, I am sure much less water would have been required.

Taking the four months, or 122 days, as the irrigating season, we used water twenty-four days and nine hours in May, twenty-six days in June, twenty-two days and nine hours in July, and twenty-three days and three hours in August, leaving twenty-six days and four hours during the irrigating season when water was not used.

These results show that one-eightieth of a cubic foot per second continuous flow is more than necessary at Twin Falls, where the soil is very deep.

I believe if the land were given a thorough irrigation late in the fall, thus storing the moisture in the soil for use the following year, it would be a great saving of time and labor, and materially lessen the amount of water used during the irrigating season, besides being more economical, and as the surrounding areas become moistened through irrigation, with proper cultural methods, less and less water will be necessary each year until half the amount used this year will be sufficient.

Just what the duty of water will be on the Twin Falls tract a few years hence, I am unable to say, but I believe that it will be far greater than now, as the people are becoming educated in the use of water, and find that less water and more attention to the soil give greater and more beneficial results. This fact was demonstrated this year on a portion of the experiment farm, where last fall it was irrigated late, and only one irrigation was required this season to produce seventy bushels of wheat to the acre and ninety-six bushels of oats.

THE BEST METHOD OF APPLYING WATER.

The character of the soil and the lay of the land should indicate the best method of applying water.

Two methods have been tried on the Twin Falls tract—flooding, and by furrows or corrugations. After a thorough trial, the corrugation method has been given the preference, and fully 90 per cent of the farmers have adopted this method.

I believe that it is the better of the two, especially when annual crops are grown, such as grain. While it is true that some others claim that the duty of water is greater by flooding than by corrugation, that has not been my experience in the portion of the arid district where I am located.

As it is understood that water only goes into the soil under pressure, and that plants practically stop growing when the air is excluded, which is done by flooding, this is objectionable.

Then again we understand that plants only use the ascending water, or capillary moisture, consequently

the ideal way of applying water is to do so without shutting off the air, or causing the soil to bake, which is the result more or less if flooding is followed in this section.

This is especially true of nearly all crops excepting grasses.

Then, again, water is more easily applied by the corrugation method than by flooding, and if the corrugation system is properly constructed, water can be applied, so that it will run night and day with less labor or care, and with comparatively none, if any, damage to the land.

I consider the corrugation method the best for applying water, at least, on this tract, or any other tract having the same conditions.

I will try to describe the system I have advocated to the farmers on this tract—the great portion of whom have followed the advice given:

First, the land is graded, so that the water will not be turned from its course in the corrugations by the high places. It is not necessary to have a perfect incline, but there should always, necessarily, be fall enough so it will continue on its course.

We then run the corrugations or small furrows two feet apart in the direction in which the water is intended to flow. Cross ditches are then run at right angles with the corrugations from 300 feet to 500 feet apart, according to the grade or fall of the land. Check boxes are put in each cross ditch, the distance apart being governed by the fall of the land. The sharper the pitch, the more check will be necessary. The nearer level the supply ditch is, the less boxes will be required, and within a reasonable limit, will carry sufficient water to irrigate the land intended.

Check boxes are so constructed that the water will flow over and not under the splash boards. The water is raised by these splash boards as high as needed, so that the water between the check boxes, when raised to full height, will stand on a level, the excess water being allowed to go over the splash boards, and be caught up by another check box.

To divert the water from the cross ditches into the corrugations, lath boxes are used—each of these boxes will supply from one to three corrugations, depending upon the pressure in the cross ditch, and the length of the corrugations.

Four laths will make two or three boxes, according to the length required. The laths are simply nailed together in the form of a square, and cut into two or three sections, as the case may require. The boxes are then placed in the bank of the ditch, the top of the lath box being a little below the level line of water, so all will receive the same pressure, and flow steadily night and day. If they are kept clear, they will remain in position for service indefinitely.

Three thousand laths will make enough boxes to furnish one for each corrugation on a forty-acre field—the field being cut into three sections.

Boxes in the head ditch for the section below control the drain water from the section above, so that all drain water is picked up, and re-distributed further on down the field.

When check boxes and lath boxes are set in place, the land being properly graded, irrigation is no longer a task. Under this system, with a regular head of water, irrigation becomes automatic.

The condition of the soil on the Twin Falls tract

is such that it takes about twelve hours to properly irrigate a field in each section, as above indicated. On many so-arranged farms, irrigation is looked after twice a day—in the morning, before work commences, and in the evening, after work is over.

It can readily be seen that irrigation under the above system is not a task, but in reality a pleasure.

When flooding is practiced, especially on new land, the water is hard to control, the cost of labor is increased, and damage to the land from water is probable.

Moreover, it is dangerous to attempt flooding at night. By the corrugation method, water can be applied by night as well as by day with perfect safety.

Besides, under the corrugation method, there are no pools formed in low spots. The land receives water uniformly in the way and manner desired.

RECLAMATION SERVICE NOTES.

Arthur P. Davis, assistant chief engineer of the Reclamation Service, has returned to Washington from an extended trip throughout the arid region, during which he has presided at the meetings of a number of important engineering boards. The work of the Reclamation Service has now reached its high water mark. Construction is going on throughout the West and many problems of vital importance to its future success are now coming up. These are due to the changing conditions, the increase of cost of materials and of labor, the complications which have ensued from floods at critical times, and the questions which must be answered where work on a large scale is started. One of the most important matters which have been under consideration is that of the control of the lower Colorado River. A board meeting extending over a week was held at various points along the river and in Los Angeles, and conferences with the engineers representing J. G. White & Co., of New York, the contractors on the Laguna dam. The extended floods of the present year have rendered the situation critical, but it is hoped that good results will be obtained by the efforts being made in Mexico to return the river to its former channel. Mr. Davis reports that it has been an unusually wet year through the arid region, especially in the Southwest.

F. H. Newell, chief engineer of the United States Reclamation Service, attended the National Irrigation Congress held in Boise, Idaho, September 3 to 8. The fourth annual conference of the engineers of the United States Reclamation Service was in session in Boise at the same time. There are now over 400 engineers and assistants in the service, carrying on work through widely scattered localities in the arid West. The bringing together of these engineers with prominent citizens from all parts of the country who are interested in irrigation, makes possible an interchange of views and the discussion of data of great value in the furtherance of the purposes of the Reclamation Act. An unusual amount of interest is being manifested throughout the country in this session of the National Irrigation Congress, and especially is this true of the East, many governors and other prominent citizens having attended. Mr. Newell will be absent several weeks, visiting many of the projects now under way, and conferring with the engineers in charge of the work and with prominent citizens and officials in the West who are co-operating heartily.

O. H. Ensign, of Los Angeles, Cal., consulting engineer of the Reclamation Service on electrical and mechanical matters, and Charles S. Slichter, of Wisconsin, supervising engineer in charge of the pumping plant at Garden City, Kas., were in Washington recently in consultation regarding recent bids for machinery for Garden City and for pumping plants at Huntley, Mont., and Williston, N. D. They have been canvassing alternative propositions for machinery and pumps, and have made recommendations to the Secretary of the Interior for acceptance of various designs of machinery. After completing the work in Washington it is expected that they will return immediately to the arid regions to supervise the installation of machinery already completed.

Contracts have been awarded for Schedules A, B, C and D, on the power and pumping system, Williston irrigation

project, North Dakota. The work on Schedule A, installing boiler plant at Station 1; Schedule B, steam operated pumps at Station 1, and Schedule D, transformers and electrically operated pumps at Station 2, was awarded to the D'Olier Engineering Company, of Philadelphia, Pa., at \$76,229.50. The contract for Schedule C, furnishing electric generating plant at Station 1, was awarded to the General Electric Company, of Schenectady, N. Y., for \$41,242. Schedules F and G, transmission line and building for Station 1, were not awarded because in the opinion of the Secretary of the Interior the bids submitted were all too high.

The board of consulting engineers of the United States Reclamation Service which recently convened at Billings, Mont., to open proposals for the construction of the structures, Division 1, Garland canal, Shoshone irrigation project, Wyoming, reports that but one bid was received. This bid was signed by the Billings Hardware Company, of Billings, Mont., for Schedules 1 to 5 inclusive, in the sum of \$56,396. The work consists of headgates, culverts, creek crossing, controlling works at Ralston Reservoir, and highway bridge abutment.

A contract has been executed with James O'Connor, of Mitchell, Neb., for the construction and completion of Schedules 7 and 8 of earthwork of distributing system, Interstate Canal, North Platte irrigation project, Nebraska and Wyoming. Schedules 7 and 8 consist of about seventeen miles of laterals. The amount of Mr. O'Connor's bid was \$20,237.

A contract has been awarded for the construction of the Lower Yellowstone dam, Lower Yellowstone irrigation project, North Dakota-Montana, to the Pacific Coast Construction Company, of Portland, Ore., for the sum of \$142,825. This dam is to be a rock-filled, timber cribbed structure across the Yellowstone River at the headworks of the canal, about eighteen miles northeast of Glendive, Mont., and according to the terms of the contract will be completed February 1, 1909. The river at this point has been considered navigable, although boats have not been up the Yellowstone River since the time of the Custer massacre. At that time the daring steamboat men succeeded in forcing light draft boats up the Yellowstone and up the Big Horn to a point where they could receive the wounded soldiers and bring relief to the troops. The building of this dam marks the close of navigation on the Yellowstone River and the practical dedication of its water to irrigation and the creation of homes for thousands of settlers in place of allowing the stream to flow idly to join the Missouri without benefit to the community.

A board of consulting engineers of the United States Reclamation Service, consisting of O. H. Ensign, electrical expert for the Pacific Coast, Charles S. Slichter, supervising engineer, Garden City irrigation project, Kansas, and A. E. Chandler, engineer, recently met in the Washington office to reconsider the proposals for pumping apparatus, Garden City project, Kansas. This meeting was called because Contractors Henion & Hubbell, of Chicago, Ill., to whom the Secretary of the Interior had awarded contract, declined to enter into the agreement in accordance with departmental requirements, the company having submitted a proposal in accordance with their own specifications. The board recommended that contract be awarded to the next lowest bidder, and the Secretary of the Interior has therefore revoked his former action and awarded contract to the Camden Iron Works, of Camden, N. J. The contract calls for ten complete units with bronze impellers and General Electric Company apparatus, for the total sum of \$14,440, and the contract may provide that thirteen additional units may be purchased for a total cost of \$32,800 for the twenty-three bronze impeller pumps and General Electric Company apparatus.

On August 7 bids were opened for the construction of a pumping plant in connection with the Huntley irrigation project, Montana. No bid was received for the work of Schedule 1, but four were received for Schedule 2, the lowest of which was that of the Camden Iron Works, of Camden, N. J., for \$12,675, and the Secretary of the Interior, today awarded contract to that company. The work called for by the contract consists of installing a water power pumping plant of two vertical shaft pumping units and accessories, each unit having a capacity of twenty-eight cubic feet of water per second, lifted fifty feet. The plant will be located near Ballantine station on the C., B. & Q. Railway, twenty-three miles east of Billings, Mont.

A contract has been awarded to James Munn, of Deadwood, S. D., for the construction and completion of structures on the main canal, Divisions 5 to 9, inclusive, and Laterals A to P, inclusive, Lower Yellowstone irrigation project, Mon-

tana-North Dakota. The work involves approximately 150,000 cubic yards of excavation, 7,000 cubic yards of concrete, 7,000 cubic yards of rip rap, 550,000 pounds of steel bars, 80,000 feet B. M. of sheet piles, 450,000 feet B. M. of lumber, and 8,000 linear feet of 8-inch to 24-inch terra cotta pipe. The cost of the work will be \$205,814.

An extension of time has been granted to the Vulcan Iron Works, of Chicago, Ill., for furnishing gates and lifting devices for use in connection with the Mimidoka irrigation project, Idaho. The drawings were modified from those of the original contract, and the delay in receiving these drawings and the difficulty in obtaining steel castings necessitated an extension of time.

The contract has been approved between D. C. Henny, engineer United States Reclamation Service, on behalf of the United States, and the Chapman Valve Manufacturing Company, of Indian Orchard, Mass., whereby the latter agrees to furnish two 36-inch gate valves and accessories to be used in connection with the Okanogan irrigation project, Washington. The amount involved is \$1,519.

The following contracts have been executed in connection with the Interstate Canal, North Platte irrigation project, Wyoming-Nebraska: For the construction and completion of Schedule 3, earthwork on about fifteen miles of laterals, Jerry Hurley, of Pratt, Wyo., \$6,830; Schedule 8, earthwork on about seven miles of laterals, Hobbs, McElroy & McElroy, of Morrill, Neb., \$9,407; Schedule 9, earthwork on about twelve miles of laterals, D. R. Noe, of Morrill, Neb., \$6,922.50; Schedule 12, earthwork on about six miles of laterals, Frank Wynegar, of Mitchell, Neb., \$3,300.

Proposals for furnishing 27,000 barrels of Portland cement for use on the Tieton and Sunnyside irrigation projects, Wash., were opened yesterday at Portland, Ore. Four bids were received as follows: Pacific Portland Cement Company, \$2 f. o. b. cars at Tolenas, Cal.; Illinois Steel Company, \$1.45 per barrel f. o. b. cars at factory, South Chicago, Ill.; West Portland Cement Company, \$2.85 per barrel f. o. b. cars, Portland, Ore., and Crowe & Co., Seattle, Wash., \$3.30 f. o. b. cars at Seattle or Tacoma, Wash. This bid subject to arrival of sailing vessels.

An extension of time of forty-five days from September 1, 1906, has been granted to Orman & Crook, contractors, for the completion of their contract for the construction of dam and canals, Belle Fourche irrigation project, South Dakota. This extension was necessitated on account of the fact that the work was greatly hampered during the early part of the season by rainy weather and scarcity of labor.

The Secretary of the Interior has executed a contract and approved the bond of the Camden Iron Works, of Camden, N. J., for furnishing pumping apparatus for the Garden City irrigation project, Kansas. The contract calls for the furnishing complete of ten motor-driven pumps of five second-foot capacity, with General Electric Company motors, bronze impellers. This work will cost the Government \$14,440.

A contract has been awarded to Jesse W. Crosby Jr., of Cowley, Wyo., for the completion of construction of a portion of the work in connection with the Corbett tunnel, Shoshone irrigation project, Wyoming. Mr. Crosby was a subcontractor under Charles Spear, of Billings, Mont., whose contract for the construction of the Corbett tunnel was suspended by the Secretary of the Interior on the fourth of August. The work for which Mr. Crosby contracted consisted of connecting the lower end of the Corbett tunnel with the Garland Canal, involving the construction of a dam, settling basin and spillways in a ravine, and a deep cut through the bank on the lower side. His contract with the Government involves \$23,740.50 and calls for the excavation of 24,000 cubic yards of earth excavation, 3,100 yards of rock excavation, together with paving, gravel filling, etc.

Bids are requested for the construction of the main canal, Tieton irrigation project, near North Yakima, Wash. The work consists of about twelve miles of main canal in the Tieton canyon, with diverting dam, headworks, tunnels and other appurtenant structures, involving about 13,000 linear feet of tunnel, 44,000 linear feet of concrete lined canal, 4,000 linear feet of unlined earth canal, and 1,000 linear feet of concrete flumes. The bids will be opened November 15th at Portland, Ore.

A contract has been executed with the Deadwood Construction Company, of Deadwood, S. D., providing for the construction and completion of Schedule 2 of the distributing system, Interstate Canal, North Platte irrigation project, Nebraska-Wyoming. This contract covers the earthwork on about eleven miles of laterals, involving the excava-

tion of 40,100 cubic yards of material. The Deadwood Construction Company will receive \$8,175 for the work.

The Secretary of the Interior has revoked his authorization of September 15th for the completion by the Reclamation Service of the Shoshone dam, Wyoming, by force account, and has executed a contract with the United States Fidelity & Guaranty Company, of Baltimore, for completing the work. On August 9th the Government officers took possession of the work and outfit of Prendegast & Clarkson, contractors on the Shoshone dam in northern Wyoming. This is one of the largest structures in the West, and the firm was not able to secure the necessary men and financial backing to carry them through the many discouragements incident to the work. The Secretary of the Interior, therefore, in accordance with the terms of the agreement, suspended their contract and authorized the continuance of the work by force account. The United States Fidelity & Guaranty Company was surety on the bond of the defaulting contractors and when they signified their willingness to take over and complete the work for the unpaid balance of the original contract price, the Secretary of the Interior decided to award them the contract, as it is not the policy of the Department to carry on work by force account where it can be practically done on reasonable terms by contract.

Bids are advertised for the construction of a dam at the outlet of Bumping Lake, Wash., for use in connection with the Yakima irrigation project. The work involves about 182,000 cubic yards of excavation, about 960 cubic yards of concrete masonry, about 980 cubic yards of rip rap and rock fill, and about 72,000 feet B. M. of hewn timber. The bids will be opened at Portland, Ore., on November 15, 1906.

The board of consulting engineers of the Reclamation Service which met on the 1st instant at Portland, Ore., to open bids on the re-advertisement for construction of storage works, Okanogan irrigation project, Washington, reports that but one bid was received, that of Sweeney & Holmes, of Portland, Ore., in the sum of \$120,440. The papers have been forwarded to the office of the Secretary of the Interior for action.

The board of consulting engineers of the Reclamation Service, which recently met at Williston, N. D., to open bids for the construction of canals and structures for the Williston irrigation project, reports that only one bid was received, that of Henry C. Delaney, of Williston, N. D. The work involves the excavation of about 220,000 cubic yards of earth, and furnishing labor and material for various structures, requiring about 40,000 feet B. M. of lumber, and 1,000 cubic yards of concrete. The bid of Mr. Delaney was in the sum of \$81,867.

A contract has been executed with the Puget Sound Bridge & Dredging Company, of Seattle, Wash., for the construction and completion of the storage feed canal, Umatilla irrigation project, Oregon. This canal is to be about twenty-five miles long, extending from the Umatilla River near Echo, Ore., to the proposed Cold Springs storage reservoir. Its construction calls for about 700,000 cubic yards of earth excavation; about 2,300 cubic yards of concrete; 6,000 cubic yards of rock excavation, and 3,600 cubic yards of rip-rap, and will cost the Government \$161,388.50.

The award of contract of the 8th ultimo, to Maney Bros. & Co., of Oklahoma City, Okla., has been vacated for the construction and completion of Schedule 5 of earthwork for distributing system, North Platte irrigation project, Nebraska, and awarded the contract to the next lowest bidder, the Deadwood Construction Company, Deadwood, S. D., at \$12,615. Maney Bros. & Co. refused to execute the contract after it was awarded to them.

Proposals have been asked for the construction of the Leasburg diversion dam and canal near Las Cruces, N. M., in connection with the Rio Grande irrigation project. The work involves the furnishing and driving of about 35,000 linear feet of round piles and 170,000 feet board measure of sheet piles, 2,600 cubic yards of concrete, 321,000 cubic yards of earth excavation and other related work. The bids will be opened at Las Cruces, N. M., on October 16th.

The Secretary of the Interior has rejected the bid of the Billings Hardware Company, of Billings, Mont., for the construction of structures on Division 1, Garland Canal, Shoshone irrigation project, Wyoming. The reason for this action is that the bid, which is for \$56,396, is believed to be unreasonably high. The work consists of headgates, crossings, culverts, bridges, etc., and involves about 18,000 cubic yards of grading, 1,800 cubic yards of concrete, the placing of 127,000 pounds of steel reinforcing bars, and other incidental work.

ANNUAL HOUSECLEANING.

The annual house cleaning of the Geological survey has just been completed, and there has been a readjustment of salaries and positions resulting from changes made by Congress in the appropriations. Some items have been reduced, while others have been increased. It has long been the policy of the survey to periodically readjust salaries at such times, and to cut out as effectively as possible the dead wood or ineffective material.

The Geological Survey is one of the bureaus of the government in which there are very few fixed salaries and where promotions or changes are considered by a board, or series of boards seeking annually to readjust on the basis of ability shown. It is, of course, easy to recommend the advancement of one man or another, but the most difficult, and at the same time necessary work of the director is that of cutting down from time to time the pay of men who, because of one reason or another have shown diminished activity, or who are accomplishing less results than their associates. There are always a few persons who, through advancing age, sickness, or other infirmities, gradually drop out, and in the interest of good administration as well as equity, the director must study how to reduce the pay in accordance with the work performed. This is not only difficult, but frequently distressing, in that men who have worked faithfully for years must be told that they are no longer young, and that they can not block the way of the more efficient and aggressive men—those upon whom is laid the responsibility of preserving a high standard of effectiveness. Many of these men have been exceptionally able in their youth, and in recognition of this they have been retained for years at relatively high salaries. Instead of letting them out entirely, it seems only fair and proper to retain them at moderate pay and to permit them to continue the duties which they can effectively perform, and in which they will not obstruct the work of the younger men.

In other cases men have fallen into bad habits, and they are given the alternative of reforming, and sometimes are put on a per diem basis, with the understanding that they must each day perform more effective work than in the past. A little jarring of this kind is usually very effective, and in a number of instances reduction of salary has not only been beneficial to the organization as a whole, but has stimulated the individual to increased activity and has resulted in restoration to the higher grade.

A number of instances which would be ludicrous if not pathetic, have arisen from the attempt of various persons in other bureaus to get transferred to the Geological Survey, under the belief that the work was easy and promotions rapid. Some of these persons, having energy and strength, have won out; others have deplored their rashness and have tried to get back to the bureau from which they came, only to find the responsible heads of these bureaus, who were glad to recommend them for transfer, will not now take them back under any consideration, and that their only recourse is to go into private employment. The maneuvers of these people, when they find that they can not "make good" in the Survey, and can not get back into their old places, are surprising.

A LARGE CONTRACT.

An important contract has just been awarded by the government to the D'Olier Engineering Company, of Philadelphia, Pa. This contract calls for the furnishing and installation, ready for operation, of an electric power plant of 450 kilowatt switchboard output, for pumping purposes, including boilers, engines, generators, switchboards, etc., in connection with the Garden City irrigation project, Kansas. The amount of the bid was \$46,300.

The plans for reclamation in this section are unique in that they contemplate the recovery of ground water in the Arkansas Valley by pumping and its distribution by means of an existing canal known as the Farmers' Ditch. The proposed system will consist of a series of separate pumping stations, each discharging into a concrete-lined flume or surface conduit, which will carry the water to the main canal. The water will be delivered into the Farmers' Ditch about one mile northeast of its headgates. The entire plant is to be operated by electricity from a central power station located near the middle of the line of pumping stations.

The bottom lands at this point are very wide and con-

stitute an excellent catchment area for rainfall, and the gravels beneath the bottom lands form an underground drainage for the contributory watershed extending both north and south of the river valley. There is practically no surface run off from this portion of the plains. The ground is so level and porous and the gravels beneath the surface so ample that they act like drains in removing all of the rainfall that is not appropriated by the vegetation and evaporation. The entire pumping plant is designed to recover an average of 100 second feet of ground water for a period of 150 days, which is equivalent to a total of 30,000 acre-feet for the irrigation season. A portion of the water recovered will be carried under the Arkansas river by a siphon 800 feet long, with a capacity of 100 second-feet.

The Farmers' Ditch covers portions of the uplands and bottoms of excellent quality. The semi-arid region of western Kansas requires but a small amount of water per acre of irrigated land, as the natural rainfall and the quality of the upland soil renders possible a very high duty of water. The value of the land in this part of Kansas in its natural condition is from \$5 to \$10 per acre. When reclaimed by irrigation it is easily worth from \$100 to \$150 per acre. The principal crops are sugar beets and alfalfa, considerable quantities of which are already under cultivation. Sugar beet factories are already located within easy shipping distance from Garden City. Back of the lands to be watered are wide strips of excellent grazing lands which will grow cane and forage plants without irrigation.

There is no doubt but that the successful initiation of a pumping plant will encourage private capital to take up the work in other sections and will ultimately result in the development of numberless pumping systems along the valleys of the plains' streams. The extension of dry farming over areas on higher levels will further extend the rural communities.

THE NORTH PLATTE PROJECT.

The supervising engineer in charge of the North Platte irrigation project, Wyoming-Nebraska, reports that on August 15th the foundation was ready for stone laying and the first stone was set in the great Pathfinder dam. The work of stone laying has continued without interruption and it is expected that the entire foundation will be ready for masonry by September 15th.

The construction of this dam has for its object the storage of flood water of the North Platte River, to be used for the irrigation of large tracts of land in Nebraska and Wyoming. It will contain 53,000 cubic yards of masonry, erected at a cost of \$1,000,000. The capacity of the reservoir will be 43,560,000 cubic feet, or more than ten times that of the Croton reservoir in New York. The annual discharge of the river is sufficient to cover 1,000,000 acres of land one foot in depth, and the dam is capable of holding back the flood and surplus waters of the entire year.

According to the last census, within the drainage basin of the Platte River is found the largest area irrigated by one stream in the United States, and the value of the improved agricultural land is probably as high as any other section, with the possible exception of the fruit belts of California and central Colorado. All the natural late summer flow of the stream has long since been exhausted by private ditches diverting water from it. A million acre feet of water, not a drop of which is now in use, will be stored annually by the Pathfinder dam, and directed through canals and ditches upon 300,000 acres of land. The canal system will be the longest in the United States, the main or Interstate Canal having a length of 140 miles. The first forty-five miles of this canal were completed early this spring and water turned into it on May 5th. Some 1,200 acres of land are in crop and have been watered during the season.

The Geddis & Seerie Stone Company, of Denver, Colo., are constructing the dam. Excellent progress is being made on all parts of the system. The great work not only means the reclamation of a vast tract of arid land, but the prevention forever of the destructive floods which annually have visited the valley.

**Send \$2.50 for The Irrigation Age
1 year, and the Primer of Irrigation**

PAYETTE VALLEY, IDAHO.

A Veritable Farmers' Eden.

PAYETTE, IDAHO, September 25th.—The city of Payette is on the main line of the Oregon Short Line Railroad, and is situated a few miles east of the State line. The population is about 3,000. Like all other valleys, those who simply ride through Payette Valley on the train will not be very favorably impressed with the layout, for it is impossible to see very much from the car window. Even though one is quick to discern evidences of prosperity and on the alert to discover opportunities, the prospective homeseeker is very apt to become discouraged while traveling through the undeveloped portion of the State.

If one really wishes to see and understand the possibilities of the fertile Payette Valley, he should

Bee culture has also been established in conjunction with the alfalfa and clover fields, and this industry promises well. A number of earloads of hives have been brought into the valley recently and more will be shipped in soon.

There is a ready market for every product of the farm. In Idaho the tiller of the soil does not need to worry about finding someone to buy his products. The active demand continues throughout the year, and the cry is always for more at satisfactory prices. Anyone with a little patience and some energy can make money here regularly every year.

It is the intention of the United States Government to divert water from the upper courses of the Payette River, which will be used in part to irrigate a large tract of country above the present Payette Valley irrigating ditches. This will open up a fine body of land, many acres of which are still subject to home-



This photo will give an idea of the abundance of water for Irrigation in the Payette Valley, Idaho.

stop off at Payette and remain here for at least a month. During his stay he can traverse the valley from one end to the other, and back again until he is familiar with the lay of the land, and what it will produce. After careful examination, the prospective homeseeker will find that the desert which formerly hid its fertile soil beneath a mantle of sagebrush has disappeared almost completely. Where the sagebrush once held sway there are now many beautiful homes, green fields and blooming orchards. In passing, it should be stated that all fruits thrive in this garden of Eden. Peaches, apples, pears, apricots and prunes grow prolifically, while figs, almonds and English walnuts yield bountifully. Prune orchards net the owners from \$100 to \$500 profit per acre annually. Other fruits yield a proportionate profit.

Alfalfa is the chief forage crop, and is cut three times a year, the average yield being seven tons to the acre, the value ranging from \$5.00 to \$15.00 a ton.

stead entry. At the head of the Payette River lie thousands of acres of splendid timber. This region is being rapidly developed by local people, who float the logs down the river to the town, where they are converted into lumber.

The advantages presented to the prospective homeseeker in the Payette Valley are becoming widely known, with the result that each succeeding day witnesses the arrival of new settlers anxious to reap the benefits of the locality. Undoubtedly, it is one of the most promising sections in the West for the ambitious immigrant.

In this connection it should be stated that irrigation has made Payette Valley what it is today. Without a liberal use of water the desert could never have been conquered.

There are innumerable opportunities here that one could not find elsewhere. If one is looking for a home,

or if one is looking for a good place to invest his surplus money, here is the place to come.

The valley is irrigated from several large ditches, the largest being thirty-five miles long and irrigating some 20,000 acres. The main head gate was constructed in cement at a cost of \$10,000. The valley proper embraces in the neighborhood of 100,000 acres, more than one-half of which is now under cultivation.

Anyone contemplating a Western trip should by all means come to Payette Valley, Idaho, and sojourn here awhile. Look up Mr. C. E. Brainard, of Payette, who will be glad to give you any information you may wish relative to opportunities in the valley. Mr. Brainard is president of the New Plymouth Land & Colonization Company, Payette, Idaho, and any communication addressed to him will be given prompt and careful attention.

NORTHWESTERN NOTES.

SPOKANE, Wash., Sept. 29.—Fifty thousand dollars will be expended by the Interstate Irrigation Company on a pumping plant to supply water for 2,000 acres of land on the west side of Hayden Lake, forty miles northeast of Spokane. The pumps will have a capacity of 6,000 gallons a minute, and it is expected to have the plant in operation early the coming year.

The officers of the company are: D. M. Drumheller, president; William O'Brien, vice-president; William C. Kipp, treasurer, and John Malloy, secretary; Alfred Coolidge, Kennedy; J. Hanley, C. B. King, A. G. Hanauer, B. Clendening and F. Taft, all of Spokane. The company has been incorporated for \$225,000.

Farmers along the Spokane River southwest of Spokane are forming a company to build an irrigation ditch on the south bank for twelve miles. A preliminary survey is to be made soon, and the company desire to get the ditch ready for next year. One thousand acres will be under the ditch, every acre of which will be as valuable as any in the Yakima Valley, or any other garden spot of Washington. The ditch will start near what is known as the Big Drift and will run to a point a few miles above old Fort Spokane.

Elmer E. Hall, formerly chief engineer of ear structure work on the Wenatchee Canal, was in Spokane a few days ago on the way to Wenatchee to finish the plat work for the Wenatchee Canal Company's holdings east of the Columbia River. This tract of land will go under in time for next season's crop. In preparation for the next extension of the canal across the Columbia River, L. P. Horton has begun work on the foundations for bridge approaches, which will be 600 feet in length on the Wenatchee side.

One thousand acres have already been purchased by D. C. Corbin in connection with the big irrigation scheme he is planning, which will involve much of the Spokane Valley between Spokane and the Idaho line.

The United States Government has begun work on the irrigation ditch near Riverside, Wash., west of Spokane. The ditch will be six miles long and irrigate 150 farms.

Governor Chamberlain, United States Senators Fulton and Gearin, Messrs. Whistler and Stover, of the Reclamation Service, and former Governor T. T. Geer and Judge Stephen A. Lowell, president of the Idaho State Irrigation Association, was among the speakers at Irrigation Day, September 25, at the district

fair at Pendleton, Ore., southwest from Spokane, and several projects of importance were taken up.

WANTED! GOOD MEN!

MAKING NEW APPOINTMENTS IN WESTERN STATES.

We want high grade men with some knowledge of irrigation in all of the Western States to act as State and special agents, to handle the Canadian Pacific Railway Company's irrigated lands. Their irrigation block (the largest in the world) consists of three million acres, and in price is the cheapest on the American continent today. Write us at once, furnishing ample references. Canadian Pacific Irrigation Colonization Company, Ltd., Room 2, Calgary, Alberta, Canada, sole selling agents for the Canadian Pacific Railway Company's Irrigated Lands.

Every owner of a dog should have a copy of "American Homoeopathic Dog Remedies." It is a compact treatise on the most frequent diseases of the dog, and gives a brief description of the common diseases. The booklet is published by the American Homoeopathic Dog Remedy Company, Chicago, and will be mailed free.

Idaho

Is one of the best irrigated states in America. In this state will thrive almost every kind of vegetable, fruit and grain of the temperate zone.

Thousands of acres of land under irrigation are still for sale in the Twin Falls district.

Low Homeseekers' Rates

to Idaho are now in effect via

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The Short Line to Idaho

Inquire of

E. L. Lomax, C. P. A.
Omaha, Neb.

Send \$2.50 for The Irrigation Age
1 year, and The Primer of Irrigation

FARMERS' NATIONAL CONGRESS.

Arrangements for the forthcoming session of the Farmers' National Congress are about concluded and a great gathering of the farmers of the United States is anticipated. An excellent program has been prepared with some of the most important national agricultural questions of the day discussed by leading experts; a remarkably interesting place scenically, historically, and agriculturally has been selected for the assembly. The railroads have given liberal reduced rates; the public spirited citizens of Rock Island, Ill., where the meetings are to be held, have planned a number of sight-seeing and social functions for the visitors; the governors of most of the States have appointed delegates. The opening session will be Tuesday, October 9, at 10 a. m., and the meetings hold through the week. Anyone can attend the sessions and take advantage of the reduced railroad rates. Those intending to go should apply at once to their local railroad agent that he may have proper blanks and information.

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IRRIGATION AGE for 1906. Send us
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FOR SALE 160 acre water right on irrigation
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This advertisement is addressed to the thousands who want homes in a country where the climate is ideal, where opportunities abound and where farming and fruit growing and stock raising are taken out of the speculative column and placed in the class of sure, safe and profitable business enterprises.

If you contemplate locating in Idaho or the West you should understand something about what is necessary to secure irrigated tracts under the Carey Law. The following will assist you:

- 1st. Make your selection of land either in person or by your representative.
- 2d. Procure your water right from us. You must have one share, or acre, of water right for each acre of land.
- 3d. At the time you secure your water right you will make, through us, your application to the State of Idaho for the land.

The price of the land is 50 cents per acre.
The price of perpetual water rights ranges from \$15 to \$25 per share according to quality and location of land.
One share of water will irrigate one acre of land. The amount furnished each year is sufficient, if placed upon the land at one time, to cover it 30 inches deep. The water is measured at the point where it is delivered to the purchaser, thereby saving him all loss from seepage or evaporation. The average rainfall in Idaho is 13 inches each year.

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BIG, RED APPLES

**Peaches, Prunes, Melons, or Make
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If your savings are small get up a little syndicate and buy 40 acres and divide it into 5 and 10 acre tracts, sending your own man along to care for it. Very cheap way if you get the right man.

We have capable men already here, but we charge for taking responsibility.

Unimproved is worth \$40.00 per acre with good water right.

Any amount of facts and figures to give if you are interested.

Drop us a card and send us the names of your friends. It is good enough to pass along.

Now, if you don't believe all this, write to any one living in the Payette Valley. They will all tell you the same thing, or best of all, come and see for yourself.

**Special Rates on Railways. 3 For Further Information
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C. E. BRAINARD, President

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The Land of Bread and Butter

SOUTH DAKOTA IS LONG ON WHEAT AND SHORT ON PEOPLE.

Today it presents the best opportunities in America for those who want to get ahead on the Highway to Independence. More than 47,000,000 bushels of corn, more than 47,000,000 bushels of wheat, live stock to the value of \$41,000,000, hay to the value of \$12,000,000, and products of the mines above \$12,000,000, were some of the returns from South Dakota for 1905. With a population of only 450,000, and the annual production of new wealth above \$166,000,000, it can be readily understood why South Dakota people are prosperous and happy.

Why don't you go there and investigate the openings along the new lines of this railway for yourself.

From Chicago and from many other points in Illinois, Minnesota, Iowa and Missouri, direct service to South Dakota is offered via the

Chicago, Milwaukee & St. Paul Railway

Its main lines and branch lines fairly gridiron the rich agricultural and stock country of South Dakota. Its mileage in South Dakota is more than 1,200 miles, and by the building of extensions is being rapidly increased.

A NEW LINE IS NOW BEING BUILT from Chamberlain, S. D., to Rapid City, S. D., through Lyman, Stanley and Pennington Counties. Some of the best opportunities for success are along these new lines. Land can now be bought at from \$10 to \$18 per acre, but these prices will soon advance. The railway company has no farm lands for sale or rent.

If you are interested, it is worth while to write today for a new book on South Dakota. It will be sent free by return mail.

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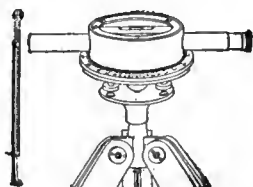
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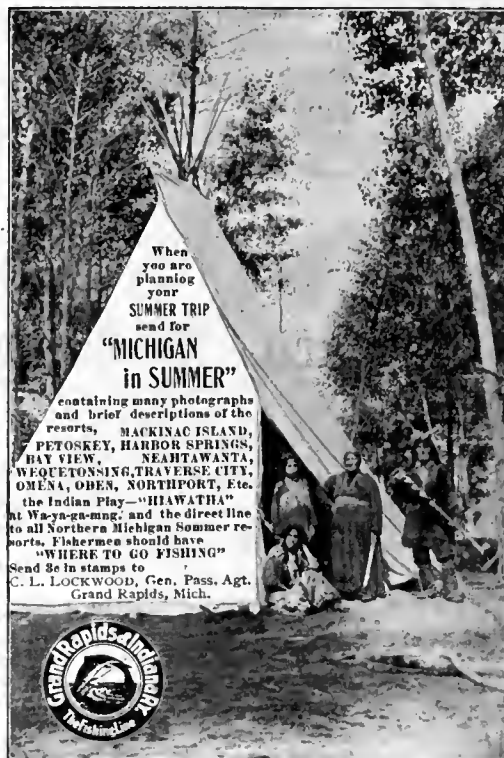
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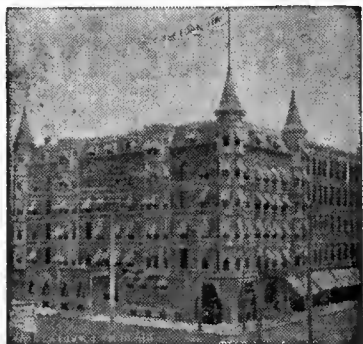
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ONE FARE PLUS \$2

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See the finest agricultural lands in the Great Northwest. Low rates afford an excellent opportunity to secure a farm in a rich and growing country, where yields are large, where excellent markets are near at hand and where irrigated districts present splendid opportunities and sure crops. Tickets bear final return limit of 21 days, with liberal stopover privileges.

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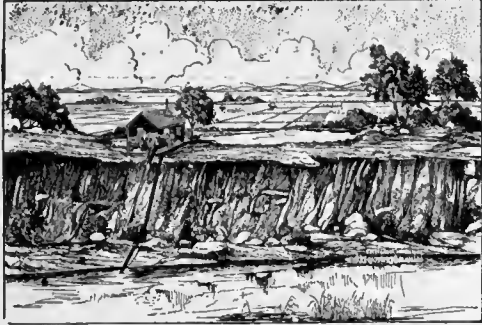
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Four feet high, No. 10 top and bottom wire, No. 13 laterals, No. 14 crossbars, 12 inches apart in one style and 6 inches apart in the other. Will keep rabbits away from your young trees, dogs or wolves away from your sheep, and will turn small chicks; spacing at the bottom 2 inches, gradually widening toward the top. A million rods of this one style will be sold this year, and orders should be placed early to insure attention.

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0725

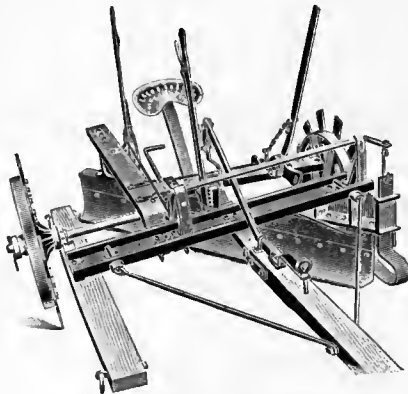
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26 inches high. Our 0725 fills the bill, and is the most popular seller that we have. No. 9 top wire, middle wires No. 12, with cross bars six inches apart; by stringing two or three barb wires

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Agents and dealers wanted throughout the entire west.

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If you have road grader work to do in any form, then get a Rural Road Grader and Ditcher, thereby saving more than half in cost of machines and working expenses.

Operated by One Man and Two Teams. Sold on Trial.

TESTIMONIAL.

SPENCER, IOWA, May 19, 1906

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I manufacture the Climax and Chief Pullers also, intended for lighter work.

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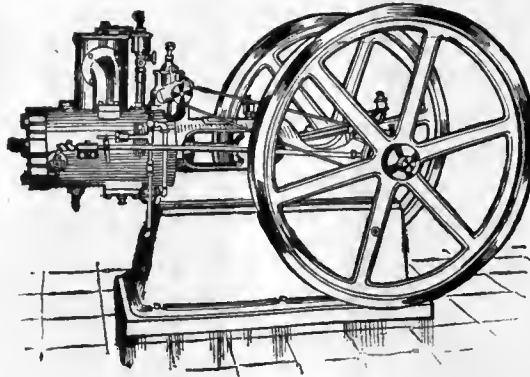
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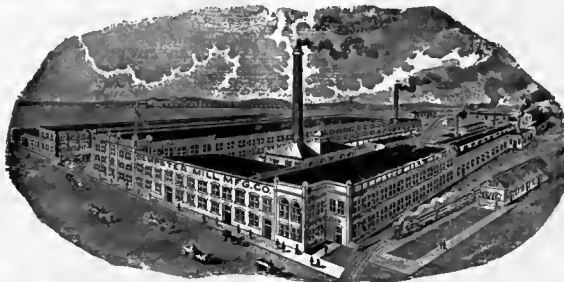
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